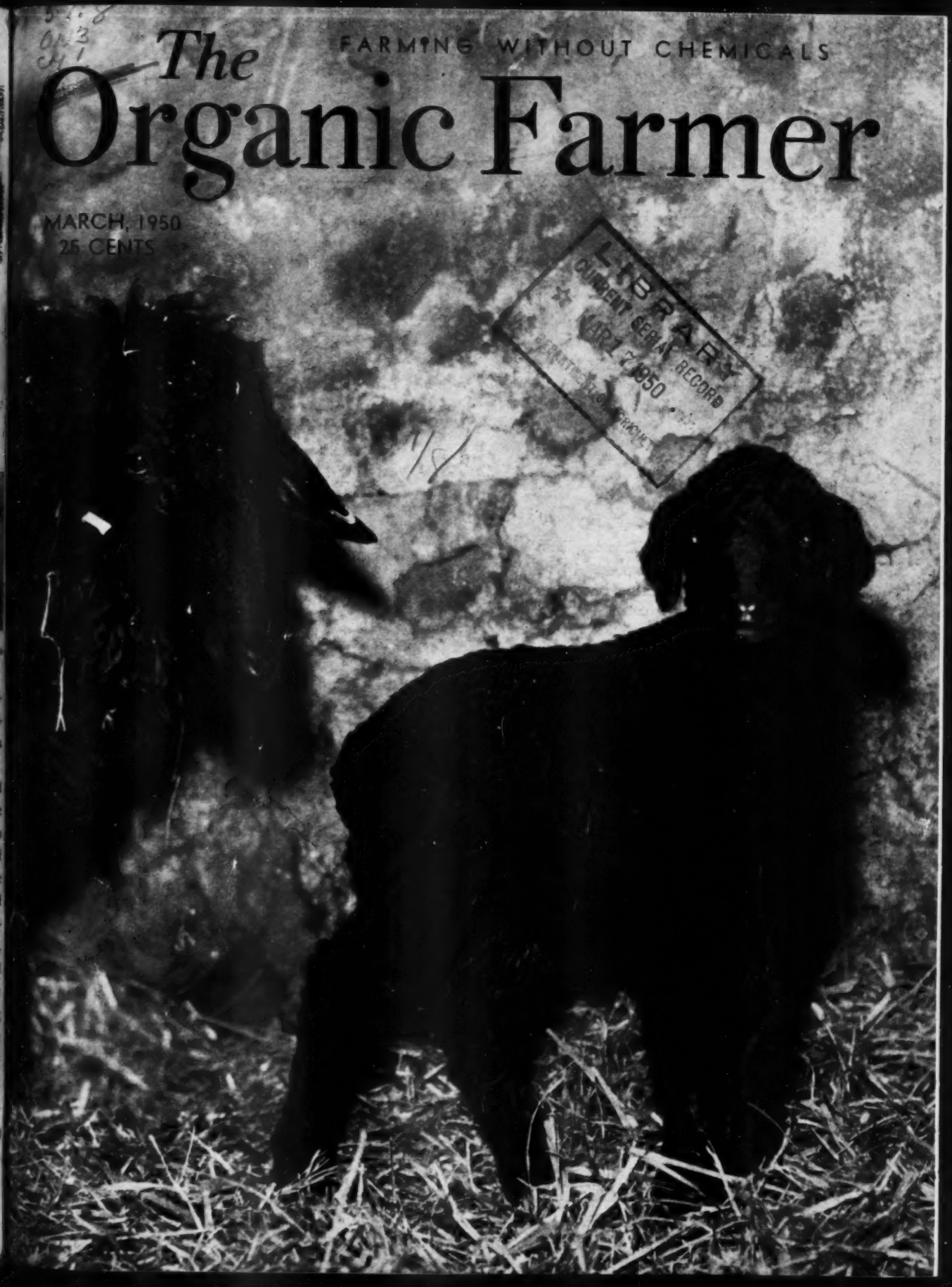
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March, 1950

The Organic Farmer

Farming Without Chemicals

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***The Cover:** A two week old Karakul lamb and her mother on the Organic Experimental Farm. For more about Karakuls, see page 38.*

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Letters

Deep Litter System Composts Chicken Manure

Dear Sir:

There is an article in the January issue of Everybody's Poultry Magazine written by D. C. Kennard and entitled "New Chickens on Old Litter." This is a very interesting article and I think the author was unconsciously giving the Organic Method a great boost. Built up litter, properly made, is really compost in the making, alive with bacteria. The health benefits passed on to the chicks or chickens must come direct from some action of the bacteria in the process of decomposition. If it can do this to chickens, it can do the same for plants.

Harry Molard,
Washburn, Wisconsin

Lemon Grower Likes Organiculture

Dear Sir:

I am a regular reader of The Organic Farmer and have received a great deal of information and enjoyment from its pages. I have a five acre lemon grove on which I have been using the Organic system for the past two and one half years with a very marked improvement in both the condition of the trees and the quality of the fruit. I use a non-tillage system combined with portable irrigation. I applied a covering of Milwaukee sludge and chicken manure and have since applied a three inch mulch of shavings and horse manure. I am also raising red earthworms and have liberated a great many of them in the grove and have more ready for liberation now. Before starting the Organic system I had a very hard plow sole in the grove with poor water penetration. Now the plow sole is entirely gone and penetration is excellent.

Albert E. Lesle,
Whittier, California

Open Pollinated Corn Has More Protein

Dear Sir:

A couple of weeks ago the owner of a small hybrid seed corn company came to visit and sell some seed. After he had shown me his literature and photographs of his magnificent hybrids, I asked him if he knew anything about the protein content of hybrid corn. He replied that he had fattened two lots of pigs on hybrid and open pollinated corn to see what would happen. The pigs on hybrid corn required 25 per cent MORE corn per pound of gain than did the other pigs. I bought some open pollinated corn from him. He said that all the growers were working on hybrids with higher protein content, but that they had had no success.

William M. Selden,
Avon, New York

Land Burning Is Affecting State of Washington's Fertility

Dear Sir:

I believe one of the greatest disasters this part of the country (Western Washington) has faced and is facing is the burning of great tracts of cut over land. A great deal of it is done unintentionally, but much of it is done with the mistaken belief that the land will be better conditioned for new forest growth or farm land.

The truth is that the fire burns not only the brush, but a great deal of the decaying leaves, twigs and evergreen needles with which the floor of the forest is covered. The result is the land is made almost sterile for years to come.

Nearly forty years ago there was a patch of wild huckleberries about half a mile west of my place, here on Vashon Island. The bushes grew among a scattered stand of old growth fir timber. Nearly every year the bushes were laden so heavy with berries that they bent almost to the ground with their load. Later the timber was cut and fires burned over the locality. Now there are but a few stunted bushes there, though a better fire prevention policy here lately has resulted in a growth of various varieties of brush. If fires can be kept from starting, I believe the tract will again become fertile—in the distant future.

Vernon Lanoreux,
Burton, Washington

Healthy Soil Is Essential In the Forest, Too

Dear Sir:

I have been a subscriber to Organic Gardening as well as the Organic Farmer for some time now and I must say your fine magazines have been most stimulating. I am a Forester employed by the U. S. Department of Agriculture, Bureau

ORGANIC WAYS CHANGE 750 "WORTHLESS" ACRES INTO RICH FARMLAND

FRIEND SYKES, A SUCCESSFUL ORGANICULTURIST, TELLS THE WHOLE STORY IN THE BOOK, "HUMUS AND THE FARMER"

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It all began when what was regarded as one of the best herds in England proved, upon government inspection, to be 66% diseased—the result of deficiencies in the food plants. The herd was dispersed and the valuable farm land sold. Friend Sykes then purchased 750 acres of land on the Salisbury Plain which farmers round about considered practically worthless. He subsoiled it and fertilized with natural manures exclusively. Pasture and crop plants were grown which were rich in minerals and other nutrient materials. As a result, the cattle and horses were maintained in such health and vigor as had been hitherto unknown, and the land is now eagerly visited by outstanding agriculturists as one of the most interesting farms in the country.

Tripoding clover for seed (from "Humus and the Farmer")

Artificials Uneconomical

In his valuable, exciting book, HUMUS AND THE FARMER, Mr. Sykes places his essential acts of good farming in the following order of importance: (1) the four year pasture, (2) good cultivation, including subsoiling, (3) organic manuring through the grazing of stock, and (4) composting. The details he gives of some of his scientific records on the farm are startling in their originality and intriguing in their indication of the inadequacy of orthodox methods.

Prize Galloway Matron, Elsie II (from "Humus and the Farmer")

In discussing the organic method with present-day agronomists, the latter invariably end the discussion by saying that the ideal method of fertilization of the soil includes the use of plenty of both organic and artificial fertilizers. This is a difficult argument to refute, but Mr. Sykes deals with it convincingly and gives comparative figures to show the financial disadvantage of adding any artificials whatever to adequate organic manuring. The author foresees a dark future for agriculture if present practices are long continued.

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of Entomology and Plant Quarantine. Since most of my time has been spent in the field during the past 18 years in California, Minnesota and Virginia on white pine blister rust control work I have had plenty of opportunity to observe how nature works unmolested in the forests and what happens when man starts upsetting things through the careless forest practices of logging and burning. A forest of trees is like any other kind of crop and to assure a healthy stand of timber the organic matter in the soil must be maintained. Many insects and diseases will not attack healthy trees, but let the forest floor be continually burned over or the soil exposed to the hot sun through clear cutting and your second growth will develop all sorts of ailments.

In the southeast the terrible needle blight of short leaf pine is destroying millions of feet of timber a year and now the white pine pole blight in the northwest is getting up terrific momentum. Plot studies in the southeast showed that diseased short leaf pines tended to recover when heavy applications of nitrogenous material was added to the soil. Experiments are still going on with the hopes that some organism is solely responsible since it is not practicable or economical to fertilize millions of acres of forest land artificially.

Thus it appears that in our forests as well as on our farms and ranches more is being taken from the soil than is being put back and insects and disease are therefore on the increase. This, of course, is not true of all diseases and insects, especially those pests which have been introduced from foreign countries and will attack our trees because no immunity has as yet been built up by them. The chestnut blight is a good example of this and white pine blister rust is another. There are many more.

It is peculiar that blister rust seems to do its worst work on trees which are in the healthiest condition while we often observe poor suppressed trees relatively free of the disease. In this respect the control of white pine blister rust, grain rust as well as many other pests is fully justified on large scale operations and today adequate control has been attained with respect to blister rust on millions of acres of white pine lands within the five major white pine growing regions of the United States.

I have written the above since very little has been said about forestry in relation to organiculture. At the present time there are two schools of thought about treating cut-over forest lands. This is burning versus non-burning. Who will win out in the long run I cannot say. To me it is like the old practice, and still is in some sections of the country, of burning over the range and pas-

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ture lands each spring with the false hope that the next crop will be better. No more needs to be said about this. All one has to do is look at so many badly eroded farms to get the answer.

As far as I can see if there is any State which needs more organiculture it is California, especially in the southern portion where water is scarce. There is becoming more interest in this type of farming but as yet very few are doing much about it. The old practices of heavy cultivation, and commercial fertilization are still way on top and dry-bark on citrus trees in this section is becoming so bad that many growers are pulling out their trees. Well, perhaps I can help to stimulate more interest along the organic methods of farming and already I have talked to many farmers about this and right now I think that many of them are ready and willing to accept anything which would save their trees. A widespread practice now very popular out here is spraying oil over the land to kill weeds. To me this seems to be the worst possible practice.

J. Curtis Ball,
Santa Barbara, Calif.

A Grocer Notices the Poor Quality Of Food He Sells

Dear Sir:

My wife and I enjoy The Organic Farmer very much and hope to own our own farm in the near future. Being in the grocery business, I know there is something wrong with our methods of agriculture. The flavor just isn't there.

Paul J. Schmidt,
Lima, Ohio.

Thoughts on Natural Agriculture

Dear Sir:

I am one of your more recent subscribers and have been reading with great interest your handbook and my first two issues.

It seems to me that you fellows really have something in this organic method. Last April I purchased this 250 acre farm and I'm in the process of building the land up to where it should be. I have definitely decided to use your organic method, as a farm which hasn't been worked for five years naturally is in need of something.

As my farm is strictly dairy, the manure for the compost will be no problem. I have one question in particular. Is it possible to make compost during the winter months in New England? If so, what is the procedure in winter?

One more thing I might mention

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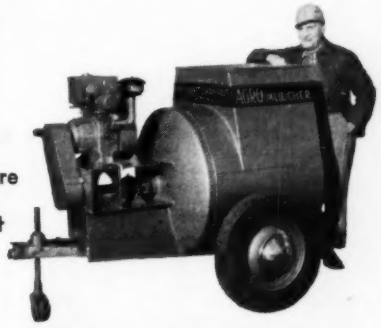

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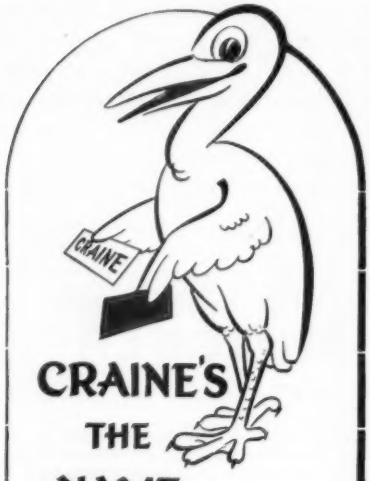

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in passing. I am a graduate of an agricultural college and during our various courses in agronomy, not once was the Organic Method mentioned. The importance of organic matter in the soil was greatly emphasized, but the use of various chemical fertilizers was strongly recommended.

Your program makes sense. How in the devil can the necessary organisms live in the soil if it is adulterated with nothing more than glorified acids!

You people really have something in this organic farming and I'm behind you 100 per cent.

Edward Watson,
Hollis, N. H.

Ed. The best way to make compost in winter is to use the enclosed Italian method. See the Editorial in this issue for more details.

Dear Sir:

I have just had your two books, *Stone Mulching* and *The Organic Front* brought to my attention and I have read them with great interest —almost devouring them! The Organic Method seems so logical and sensible. I had not given it much thought before reading the books.

Mrs. E. D. Welin,
Puente, California.

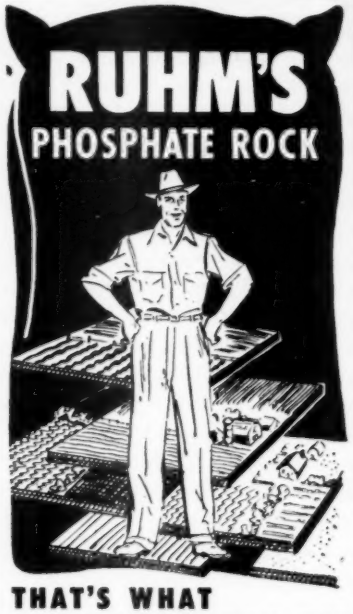
Phosphate Rock Agent Reports Increased Sales

Dear Sir:

I have received my first issues of The Organic Farmer and I am very glad that I subscribed for it. I believe it is one of the best farm magazines.

Thanks for the good articles on rock phosphate. I am one of the Thomson Phosphate agents here in south western Pennsylvania and am beginning to sell quite a few carloads. Every farmer who has tried it is well pleased and most of them have ordered 10 to 30 tons for spring delivery.

J. C. Ansell,
Jennerstown, Pa.



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With the Editor

The Manure Handling Problem

The ultimate value of manure to the soil depends on the treatment it receives

THERE is a little confusion regarding the matter of handling manure in the new organic method and I would like to set down a few facts that might be of interest. Up to about six months ago it was advised to make compost out of manure, using the heap or pit method and mixing about three times as much organic matter (weeds, leaves, grass, spoiled hay, etc.) with the manure. This represents a lot of work. In the new method, the farmer should attempt to seek out as much salvage organic green matter that he can find within a reasonable radius of his farm. It is surprising how many tons of leaves, weeds, sawdust, corn cobs, and other wastes can be obtained free that may be worth thousands of dollars a year to him. This matter should be ground up if possible in an ensilage cutter and applied directly to the soil without composting. It should be put in fields which are resting from a crop. At least two months of summer weather and much longer over colder seasons should be allowed before a crop is planted in this material which can be disced in or left as a mulch depending on various conditions.

Manure can be handled in two ways. It can be hauled out directly to the fields as it accumulates, or it can be stored or composted. If it is spring or summer and there is a proper place for it in a field, it should be applied directly, but should be disced or plowed right in. If even one day goes by between applying the manure and discing it in there is a great loss which will be reflected in a lower yield. Experiments were done where manure was left lying on the soil for about a week before being plowed under and the resultant yield of the plant went down by almost one-half. Organic matter is closely tied in with the general process of the release of nitrogen in the soil and the more organic matter is properly applied to the soil, the more nitrogen will be available to the growing crop and the greater the yield.

Some farmers haul their manure out to the fields daily and, during the winter, put it on top of snow. Especially on a farm that has rolling land there will be disastrous losses where this method is followed. I have recently read that in the State of Iowa the average farm produces about $570 worth of manure each year, but if it is not handled proper-

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Editorial

Continued

ly it could easily lose at least $300 worth of its value. If it is handled with care the $300 might be reflected in double its value by increasing yields.

In connection with the fattening of steers and in loafing sheds for cows there is a method of handling the manure over the winter which is called the English fold-yard method. The manure is not cleaned out of the barn for the entire winter. Every few days more straw or other litter material is applied on top of the manure to keep it dry. By spring it is partially composted and can be safely applied to a soil which will be planted with a spring crop. In the first year there may be some odor in the shed, but after that, the floor of the barn will be so saturated with bacteria that they will not only keep the odors down but will speed decomposition of the manure. Where the floor is of dirt, much valuable material will leach down into it and such soil can be dug out to be mixed with the manure and replaced by other soil.

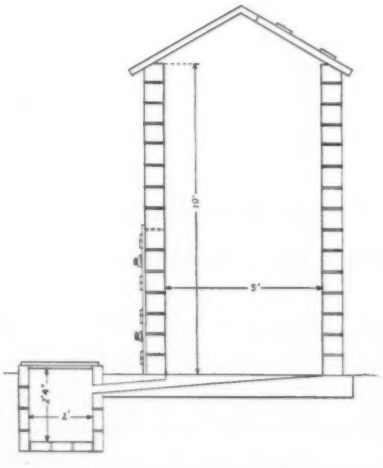
Another method of storing manure over the winter is to make a place with a cement bottom so that there will be no liquid leachings from below, and a covered roof so that heavy rains will not waterlog the manure. If possible, then cover the top and sides of the pile with soil so that oxidized substances and gases will be absorbed into it and not lost into the air.

The most effective way, however, to handle manure, especially if there are large quantities, is by the Italian, all-enclosed method. The drawings will give you a general idea of one way of making such a device. Its action is somewhat like a coal stove, although there need not be a chimney or a draft. The raw material is put in through the top, and the finished product is taken out from the bottom. As compost comes out, more manure is put in at the top. While it is not a completely airless method, the idea is to permit as little air as possible to get in so that the carbon dioxide released from the decaying manure be not dissipated into the atmosphere. A soil enriched with organic matter is usually well charged with carbon dioxide which exerts a beneficial effect on the fertility of the soil. We want to duplicate that condition in our mass of manure, so as to have the same quality of air in it as near as possible to that of usual soil-air. It is not an airless process. Some air will get into the silo.

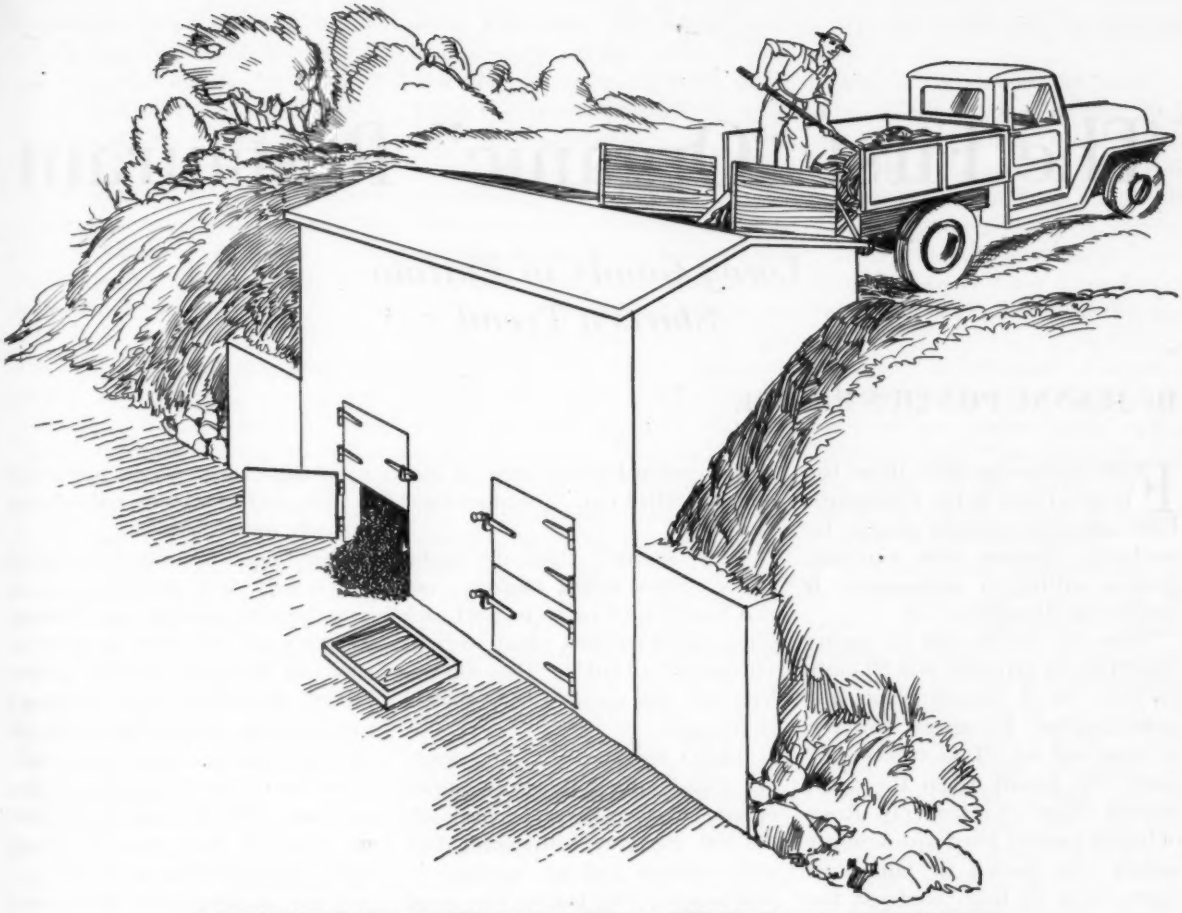
The Italian silo should be four times as high as it is wide. A unit like that on the opposite page is divided into three sections by partitions. There are three separate covers on the side from which the truck is unloading, one over each of the sections.

The manure contains sufficient liquids, and water or rain should not be permitted to enter. Some of the liquid will drain into the small drainage pit shown in the picture. This could be applied to the garden in a place where nothing is to grow for two or three months, or if there is enough of it, it could be placed on the farm soil. In two or three months the manure should be ready for use. This method should be excellent in dry country where manure lying on a soil will not decay readily because of lack of rains. Much of the moisture will be dissipated into the air in such a climate. It has been found that this method does not work as well with all green matter as with manure. We are asked, "What about the weeds in the manure? In ordinary composting the heat will kill them out. How about the Italian method?" We have not yet done sufficient experimental work to give a complete answer to this question. This will be done this summer. In comparison with the ordinary method of applying the manure straight to the soil there would not be much difference. In fact manure from an Italian silo would, I am sure, have some of the weed seeds killed, for there is much heat generated in it, although not as much as in the composting method. At any rate, manure does not pose the problem of weed seeds as does green matter used in regular composting methods. The straw usually used as litter in manure has a minimum of weed seeds. We have found that in practicing the organic method a few years, and with proper cultivation methods, it is not a difficult matter to get weeds under control. There seems to be some evidence that less weeds grow in a highly fertile soil well stocked with organic matter. I know of an experiment where part of the seeds from a Canadian thistle sprouted in a plot containing clay soil, while the balance placed into a mixture of horse manure and garbage did not, or grew poorly. Also the weed problem can be much reduced by planting green manure crops in as many crops that are grown. In the grains especially, the planting of a companion crop in it will smother out weeds.

Another question is asked, "In an ordinary compost heap, the high heat kills out disease organisms. Since there is not anywhere near such heat in the Italian silo method, will we have less control over disease in it?" The answer to this is not too simple to give. In the equation of disease there are two factors. Disease organisms and the disease controlling fungi and bacteria such as penicillium. Little is known about the



Cross section of the enclosed manure "silo" shown on the opposite page.



A LARGE SCALE APPLICATION OF THE ITALIAN METHOD OF HANDLING MANURE.

way the processes in the soil take care of disease. If the high heat of the compost heap will kill out disease organisms, will it not also kill out the anti-biotic organisms, and other beneficial bacteria and fungi? According to Dr. Selman Waksman of Rutgers University, the mere presence of organic matter acts as a deterrent to disease in the soil. It no doubt multiplies the penicillium type organisms and thus keeps down the dangerous, disease-producing, pathogenic bacteria. Organic matter in some way acts as an inhibitor or preventative to the action of disease germs and since the Italian method seems to produce a higher quality organic matter, well supplied with nutrients, the problem of the control of disease may, if anything, be better controlled than with compost made in the open method.

One reader writes in that he believes the Italian method will work out wonderfully in his region because of the heavy rainfall there which used to wash into his compost heaps. In other sections there may be problems. Time will work out the kinks.

Another reader writes: "The cow manure, from 3 to 5 cows, is now flushed with water into a big concrete tank. The mixture is stirred up and pumped into an affair like a sprinkling cart and the crops are sprinkled with this liquid manure. Is this the best way to 'stretch' our supply of cow manure? How should we go about using some of this liquid manure to make compost, either in compost piles or by sheet composting?"

I replied: "I think your method of handling your manure with extra water is a good one but I would not put that sort of material on a growing crop. If you could find some place on the farm where a crop is resting so that it would have several months in which to decay, that would be an excellent method. If it is a period of the year where there are no such places available, then I believe it would be better to clean the manure out without watering it and pile it up under cover so that too much air or rain would not get at it." He could also build an Italian square or round silo as described in this article.

J. I. RODALE.

The First "Organic" Restaurant

Leroy Gandy of Buffalo Starts a Trend

By JEANNE PONTIUS RINDGE

FOR thirty-nine days there had been no rain in the Ellicottville hills—and only scattered showers beforehand. Pastures were parching, gardens wilting to nothingness. It was the Big Drought of '49.

When Mr. Gandy told his county agent that he expected over 50 bushels from his 96 tomato plants, the agent laughed. He agreed, however, to come and see. "Like vegetables?" asked Mr. Gandy when the agent arrived. "Sure", was the reply. Rows of bushel baskets, filled with summer squash (18 bushels of butternuts alone, from 40 hills) bordered the garden. Grabbing an empty, Mr. Gandy quickly filled it with several kinds of squash, cauliflower, brussel sprouts, limas, cucumbers, green beans, golden bantam corn—all lush and well filled out. Tomatoes came last.

"Holy smoke!" cried the agent. It took three stakes, bushing out and bound with twine to hold each great, heavy-trunked plant with its burden of "red-gold". "How did you irrigate?" the agent asked, amazed at the sight.

"Didn't irrigate." Leaning down, Mr. Gandy lifted the thick mulch of spoiled clover hay. Underneath, the soil was gray with mold, dark with moisture and its "stuffing" of rich humus. The baking sun could not penetrate.

"How do you control blight?" was the next question. The agent was constantly beset with this problem in an area where blight was taking a heavy toll of whatever the drying sun left untouched.

"No blight to control," laughed Mr. Gandy, fully satisfied with the sensation his garden was creating. "There's not an ounce of spray or chemical fertilizer on this garden. I don't need either one. I haven't touched these plants for weeks—except for picking. They were cultivated until well-umbrellaed—then mulched. Put the right things into the soil—and leave out the wrong ones. That's all there is to it."

It was a thoughtful young man who went home with his bushel of vegetables, organically grown in the midst of killing drought.

Leroy Gandy, whose "Gandy's" restaurant in Buffalo is famous across the nation, has been farming organically ever since a Buffalo doctor dropped a copy of *Organic Gardening* magazine on his desk five years ago. It rang a bell for the restaurateur whose childhood had been spent on a Jersey farm where chemical fertilizers were unknown, where the rank salt-marsh grass was used to advantage as mulch and cattle bedding. Returned to the soil, it became, along with animal manure, adequate fertilizer. He could not remember any such disease epidemics as those that plague the modern farmer.

"This is for me", said Mr. Gandy after thumbing the magazine. His Ellicottville farm, south of Buffalo in the hills—until then more of a

Mr. Gandy's seafood, for which he is famous, comes direct from his own shippers. Chefs now are enthusiastic "organiculturists."

recreation center and retreat for the Gandy family—was to become, not only organic, but also the producer of an increasing and spectacularly popular portion of his restaurant output.

Last summer a yellow card was attached to his famous menu of "shore dinners". It read, "Fresh Vegetable Plate – 75c. These vegetables are organically grown on our own farm. No chemical fertilizer, dusting powder or spray materials used in our gardens."

Far from being a mystery to his clients, the little card attracted an increasing number of excited customers who grabbed the proprietor's lapel, shouting, "Gandy, I didn't know you believed in this. I've been gardening this way for years!"

The restaurant is becoming a mecca for the "organic enthusiasts". No "crack pots", these, Mr. Gandy is amazed at the "number of our best people who believe in no chemicals, no poison sprays as the right road for agriculture."

Mr. Gandy is in a unique position as a "test case" for the organic theory. Not only is the evidence of its success undeniable on the farm, but also, he has the proof of the pudding—the eating, tested by some of the nation's most discriminating gourmets, as well as by the hurried business man—who's just plain hungry for good food.

"In the old days, I used to bring in squash and sometimes other vegetables from the farm. My cooks always groaned when I did it. 'Please, Mr. Gandy, no more squash', they'd plead. 'We can't get rid of it'". Last summer the garden was increased from ¾ acre to 2 acres—the yield of squash and other vegetables was many times that of "the old days". The chef groaned last summer only when he was unable to fill the orders. Summer squash, once an item seldom requested by customers, always was running short.

Mr. Gandy expected that he would have a large supply of winter squash and root vegetables to last the winter. Instead, the supply was exhausted by December. The yellow card had to come off the menu. "The difference in taste of those vegetables is just unbelievable", remarks the restaurant hostess.

"I've frozen only a few of my vegetables", Mr. Gandy reports, "but the beans and peas, particularly, were so superior in flavor to the best variety of frozen stuff I can buy, that my plan is to have, eventually, a production center on the farm which will supply practically all my own food." This will include his own meat, a mill for grinding his own wheat, with which his chefs will make their own bread. "All this will take time, so I hope people won't look for these things too soon", he adds.

When Mr. Gandy bought his 267 acre farm with its 152 acres of pasture and woods (the rest tillable but long neglected), he chose it for aesthetic reasons. He soon noticed, however, that the new scrub trees and golden rod were growing lustily. "This is good soil", said the farmer in him. The farmer won—"This land must be used".

Behind the barn was a massive round hill, overgrown with grass. Kicking it open with his foot, he found it spongy and black, the output of years, probably, of the 55 dairy cows which once had filled the barn.

Mr. Gandy and his two helpers—sons of the original owners, long dead—covered three acres thickly with the great mass, including soil scraped six inches deep beneath it. He then planted the area to corn. "The growth of corn was so rank", he remembers, "that I could see to the row where the manuring had stopped".

When the *Organic Gardening* magazine dropped on his desk, the rain had just spoiled a fine cutting of clover hay. "Let's burn it", said the men. "Never again" was the emphatic answer. Tons of it were stacked by the barn instead.

The man who supplied the restaurant with eggs raised them indoors on the outskirts of Buffalo. "What do you do with the scrapings?" the new organic farmer asked him one day. "Oh, we pay a man to haul it away once a week". With permission to "help yourself", Mr. Gandy pulled his trailer into the chicken farm once a week, and hauled an overflowing load of rich poultry manure back to his farm.

The trailer then brought in loads of leafmold and humus from the woods. This, with the chicken manure and spoiled hay were mixed

Gandy's restaurant is known nation-wide. During the summer months the menu in the window advertises "organically grown vegetables."

The First "Organic" Restaurant *Continued*

in in the Fall and left until Spring, without turning. As soon as possible in the Spring, it was forked over, and then carried to the garden at planting time.

His three quarter acre garden space was covered with 14 2-horse loads of manure from the barn (supplied by 8 feeder steers and 3 horses). This was plowed under and the garden carefully fitted. The compost was used in the rows at planting time. That first summer of using the organic method gave him 38 bushels of tomatoes from 100 plants. Last summer, the drought year, the total was 53 bushels from 96 plants.

Although he still believes in composting, at least for garden crops, Mr. Gandy laughs at the contention that "organic farming is too much work". On the contrary, he has found, "it is far easier than the 'modern' methods, and certainly cheaper. I have planted lots of fruit. It is all coming fine. Yet I have neither the expense of spray equipment, nor all the labor of constant spraying. Besides, as I plan my farm, the fertilizer will become, in large measure, a by-product of my own place. The forest is full of humus, and the livestock manure is free fertilizer for the taking. All the time, I'm building up the soil, rather than depleting it. Our clay loam would become very hard to work if filled with chemical fertilizers. As it is, it becomes more friable each year, and as you have seen with the garden, I don't worry with drought, irrigating and so on".

Organic experimenters have found that chemical fertilizers tend to burn humus from the soil, leaving it hard and unworkable. By building the humus content of the soil, the organic matter acts as a sponge, which absorbs and hangs on to every drop of available moisture.

Mr. Gandy exudes enthusiasm—thoroughly contagious—about organic farming. He takes hours of his time to explain to anyone interested in his organic method and his success with it. As people are coming in increasing numbers for just that purpose, he is uncertain about discovering sufficient hours in his day.

Vegetables Get Rotted Compost

The New Method (the process of hauling fresh animal and green manures directly onto the fields and plowing under) is all right for grain and pasture, Mr. Gandy believes. He always "sheet composts" his fields—"it's only common sense", he says. He is not yet convinced that the same method is best for the garden. "I want my vegetables to mature as quickly as possible. Last summer I had cauliflower and Brussels sprouts two weeks before any were available elsewhere—even from the West. Well-rotted compost on the garden gets vegetables off to a quick start", he says. There is bound to be a certain time lag, he believes, after spreading fresh manure, for the bacteria of the soil must break it down, and nitrogen is used up in the process which could be available to the plant growth. Other experimenters believe that in a soil well-filled with humus, there need be no time-lag. For most farm operations, however, the matter of a few days maturing time is not so important as it is with Mr. Gandy and his vegetables.

By permitting steer manure (he feeds the steers for a neighbor) to accumulate in the barn all winter —leaving it there all summer—the breaking down process already has started by the time it is hauled to the compost heap in the fall. The one turning in the spring Mr. Gandy considers sufficient.

Livestock Rounds Out Mr. Gandy's Program

The Gandy farm, as it is developing, will become a combination truck and livestock farm, which will give the proper "balance", both as to farm management and in restaurant produce. The two acres of garden will be expanded as need arises, utilizing fertilizer from his livestock "fertilizer factory".

There already are three horses and several pigs on the farm, and he recently has purchased two pure-bred Angus heifers which will be the start of a breeding herd. Oddly enough, the "protein" for which his restaurant became famous—seafood ("the best that can be purchased, direct from our own shippers on the coast") already is "organically grown!" Eventually there will be added to the fare his own hams and organically grown Angus steaks.

Mr. Gandy is improving his hay meadows a few acres each year. His process is to sheet compost the sod and plow it under deeply in the fall ("It hasn't been plowed for probably twenty years", he figures). In the Spring he plants it to oats or barley, with a hay mixture of timothy, medium red clover and ladino. "Our temperatures often drop to 30 below in winter. This causes a heaving of alfalfa, but does not affect the clovers".

Last Spring Mr. Gandy planted strawberries, grapes, and raspberries. All of them well mulched, they thrived in spite of drought. The raspberries, planted one every six inches, grew four feet high the first season, and bore large fruit until heavy frost, although not an everbearing variety.

The nurseryman from whom he bought the plants dropped into the restaurant in the Fall. "How are your plants doing", he asked. "All right", said Mr. Gandy, reservedly. "All right"! the nurseryman exploded, "They're phenomenal! I went up there to see you but you weren't there. So I just looked around. I wouldn't believe those raspberries if I hadn't seen them. I wish I could take all my customers to see them. What under the sun are you doing to them?"

With patience and enthusiasm, Mr. Gandy told him the "good news" about organic farming!

Crops

Balanced Fertility With Green Manure

By DR. R. E. STEPHENSON

Reprinted from Better Fruit

A TWO-TON growth, dry weight, of tops of Austrian field peas could be expected to contain approximately 80 pounds of nitrogen, 25 pounds of phosphoric acid and 70 pounds of potash. The root system should be equivalent to one half the top growth or one ton an acre with about the same composition as the tops, and should, therefore, add 50 per cent to the above nutrient content.

In terms of commercial fertilizers, the above green manure would be nearly equivalent to 1,000 pounds an acre of a 12-4-10 fertilizer mixture. The nutrients, except for the nitrogen in the case of a legume, of course, come from the soil and not from an outside source as in the case of fertilizers. But because green materials rot quickly, the nutrient content is readily available to crops.

The cover crop mobilizes all essential plant nutrients not just the N-P-K of the standard complete fertilizer. The three-ton growth of roots and tops of peas would contain approximately 85 pounds of calcium, 22 pounds of magnesium, 14 pounds of sulphur, about one-tenth of a pound of boron, and a small portion of copper, zinc, manganese, and iron that all plants must have for growth.

Organisms Improve Soil

When worked into the soil, the green manure becomes food for millions of soil organisms, both plant and animal, that liberate these nutrients and serve other important functions for soil improvement. Good soil is a living system and the more fertile the soil and the better it is supplied with organic matter, the greater the living population is likely to be. These organisms not only decompose any kind of organic material that may be returned to the soil but they bring about physical improvement as well.

Soil organisms consume some nutrient, which is temporarily withdrawn from circulation, but only for a short time for the cells of organisms, the bodies of insects, larvae, earthworms and all animal and plant life soon decompose and return their nutrients to the soil.

All living things must ultimately return to the earth from whence they came. Part of the function of a cover crop, therefore, is to increase the number of useful organisms to help enrich the earth. The soil differs from the deep earth beneath in part due to the many living organisms that inhabit the soil to give it properties more favorable to the growth of plants.

Soil Gradually Enriched

As the green manure rots in the soil, there is produced much carbonic acid, some humus acids, a portion of nitrous acid and other solvents that attack the more inert minerals, such as mica, feldspar, hornblende and others, to bring essential nutrients into solution for plant use.

This solvent and mobilizing effect will continue as long as soils are used to grow plants, and in proportion as green manures and other organic wastes are returned to the soil. The size of this mobilized supply of circulating nutrients is an important factor in determining whether nutrient deficiencies will appear to reduce crop yields, or whether there is an abundance for a big harvest.

In the case of nutrients present in the soil in small amounts such as zinc in some soils, the greater portion may be localized in the zone of humus accumulation. Deep roots have penetrated the soil gradually to absorb zinc which was carried to the foliage for growth.

Weeds Often Valuable Aids

When the foliage was dropped upon the soil to rot, the zinc was left at the surface where, through many years of gradual accumulation, the surface soil has been enriched at the expense of the deeper layers beneath. Certain plants, often weeds, which are just as valuable for humus renewal though of no commercial value, become accumulators of certain elements.

These plants long grown in one area enrich the surface soil of the area in this particular element even to the extent of correcting nutrient deficiencies by the process.

In growing cover crops, therefore,

Balanced Fertility with Green Manure *Continued*

variation in the cover selection from one season to another is desirable to produce crops with different capacities for extracting certain elements from an inert soil. A variation in the depth of root penetration is helpful. The crop that roots deeply may tap a new supply of nutrients below the depth reached by the more shallow-rooted plants.

Quick Growth Helpful

While legumes are often preferable, especially for poor land when one can be grown successfully, non-legumes are not without high value. In fact, a non-legume may have certain advantages, such as the quick growth and heavy tonnage produced by sudan grass, as a cover and green manure crop.

Not only the chemical efforts but the physical improvements of the soil brought about by green manuring need consideration. Big roots go deeply and make many soil perforations which remain stable for a long time after the root has rotted and become part of the soil humus.

These large perforations are valuable for allowing quick water penetration into the soil and ready removal of excess water by drainage. Such plants as sweet clover have noticeably improved drainage of soils previously sluggish in eliminating excess water.

Commercial Crop Aided

Channels left by roots of soil-improving cover crops serve also to afford easy entrance for roots of trees or whatever other commercial crop is produced. The commercial crop will root more deeply and profusely after the deep soil has been opened by vigorous cover crop roots. Thus the commercial crop may be enabled to tap new sources of nutrients in the deep soil as the result of green manuring.

Zinc deficiency in cherry orchards has been observed on shallow soils where no deficiency appeared on deeper soils of the same area. Deep soils mean greater root volume and more contacts between soil and roots for withdrawing nutrients.

Good aeration is necessary for those processes that make nutrients available in the soil and for the normal functioning of plant roots which absorb the nutrients. Aeration occurs through the large channels made by deeply penetrating cover crop roots and through channels made by burrowing animal organisms, such as earthworms, which thrive on abundance of organic matter where the soil is near neutral and moist but not too wet.

Channels Are Important

Good soil is a maze of tunnels and channels of varying size. These are just as important to the growth of the crop as are the solid particles of earth commonly thought of as constituting the soil.

No other soil treatment will do as much to improve soil structure as humus renewal and the perforating and the soil shattering effect of a profuse cover crop root system. There is no economical chemical treatment that will do much to improve soil structure which has been labeled the "key to soil fertility." Therefore, considerable effort is justified to create and maintain a favorable crumb structure in the soil.

There is much virtue in the profusion of fine roots which some plants supply in the surface soil. An over-cultivated, burned-out soil of heavy texture disperses badly, runs together like cement, and the surface crusts over until a young seedling can scarcely emerge unless the soil can be kept moist until the plants are well started. Plant roots cannot function efficiently in such a soil.

A profusion of fine roots of a cover crop, such as grain, consistently grown will shatter the tight soil, and the humus, and the organisms further mellow and pulverize it. This is a practical means of making good soil out of bad and of counteracting an unfavorable texture.

Strawberries Help Soil

Strawberries are not grown as soil improvers, but the profusion of surface roots in an old strawberry bed together with the humus contributed and the soil organisms supported, results in a soil so noticeably mellowed that tillage is made easy where unmanured and clean cultivated soil works unpleasantly hard.

Unmellowed soil is just as bad for the crop as for the cultivator. Surface roots of clovers are especially effective for bringing about this desirable type of mellowing structure improvement of the surface soil. Clovers have been called natural aerators. More clover is needed for soil improvement.

Erosion is perhaps the greatest of all hazards on cultivated soils that are steep. In orchards, or with row crops such as berries, where the soil may be bare during the winter, erosion may be severe. The damage is greatest when tillage is up and down the slopes, and least when tillage is across slopes with the contour. Whether there are gullies or only the insidious sheet erosion that is sometimes overlooked, the loss may be great.

Replacement May Take Centuries

Since nature contrives to enrich the surface soil, and man aids this natural tendency in proportion as he is a good farmer by applying fertilizers and various manures, any loss of the surface soil causes undue loss of fertility.

The top foot of soil is worth much more to the crop than the next foot with gradually diminishing value of the deeper soil for crop production, until with the top foot or two gone with erosion, the remaining soil may be nearly worthless for cropping.

(*Continued on page* 41)

Planning Organic Profits

Organically raised food is a superior product. It deserves superior merchandising.

By LEONARD F. DODGE

FOR MANY farmers, the organically raised food product represents literally the chance of a lifetime to win true prosperity and independent security for themselves, their families, and their lands. Next to the organic method itself, promotional methods should be their chief concern. In fact, whether we happen to be full time farmers or not, the harder we all work to further the organic movement, the more we stand to advance our individual careers. Unselfish individual effort in behalf of a truly great cause cannot fail to enrich the individual both in material rewards and in the mighty intangibles that govern individual success in any walk of life: vision, strength of character, self confidence, tranquillity of spirit. No matter how large or small our individual production of organic foods may be at this stage, we all have a tremendous idea to sell, and it behooves us to know all we can about ways and means of convincing others of the mighty implication of that idea.

Frankly, the following information and suggestions are intentionally of a general nature, because for each of us the organic idea is an intensely personal thing, bound up closely to our individual natures, our personal ways of doing things, and our special ambitions. Imagination, creative planning, originality, vision, thought and study are the qualities that we must pour into our promotional program.

First, it is obvious that everyone is a prospect for organically raised food products, and that selling direct to the customer is the most profitable method. We can narrow that down. Our best prospects at this stage are persons of above-average intelligence and education—professional men, community leaders, outstanding citizens. Such people are receptive to ideas and have the perception and background to see and grasp the implications of the organic concept. They have the initiative to act quickly, even at some inconvenience to themselves; they are prompt buyers. They have the ability to convince others of the merit of our cause and of our products, and they have the broad outlook and the personal drive to do just that. Moreover, they already have a following; their opinions and ideas and suggestions carry weight with a lot of people. So, although we will appeal to the general public and work on everybody we chance to contact, we perhaps should make a special effort to convert this special group and to sell direct to them early in our campaign. If we have already been selling organic products and have neglected this special group in the past we should see to it that we don't this season if we want to progress most rapidly. Readers of *Organic Gardening*, and of *The Organic Farmer* are potential mail-buyers from this special group, a sort of special group within a special group.

As for the size of the individual promotional program, the old rule is a safe one: promote as though you had at least twice the quantity for sale. Better safe than sorry.

For convenience in planning we can divide our program into two sections: advertising and direct-contact selling. Let's review advertising as it applies to organic food products.

Of course, high quality in all our advertising is a must. We have an infinitely superior product, and our appeal is slanted toward a special market group of higher-than-average mental qualifications. Moreover, no small part of our mission is to impress, educate and convince Mr. Average Prospect, who will see in the quality of our advertising a reflection of the quality of our idea and of our product. In short, we want every reader to feel the impact of a tremendous idea and to see and become enthusiastic over it to the extent that he will "buy" it and our product. To that happy end, we must make him feel that it is dramatic, revolutionary, vital to his health, and to that of his loved ones —something to be looked into and acted upon immediately.

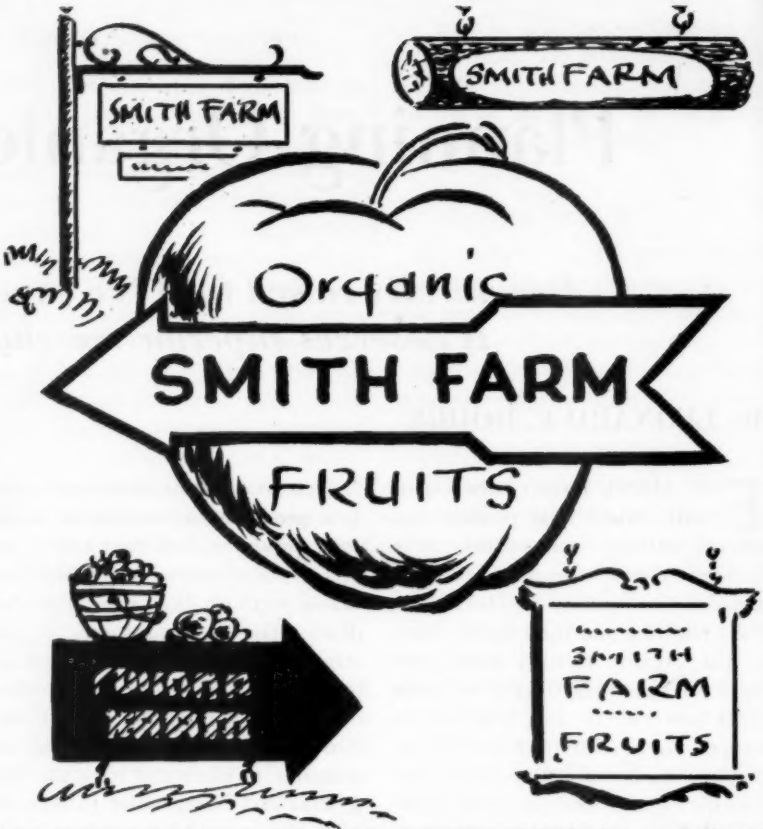
Now we can't do that by direct statement, because he would in all probability dismiss our enthusiastic claims as the silly outpourings of some new kind of crackpot. So we employ the power of suggestion to create those impressions in his mind. The secret is simply to let the simplicity of our "layout" (all-over de-

sign), the excellence of our art work, the abundance of our photographic proof, and the harmonious neatness of our printed message do the job. *The secret of making our message effective is to lean over backward to keep it conservative.* People respond emotionally to pictures and design, and accept photographic proof, but they tend to resist direct argument, no matter how logical. In fact, one of the surest ways to create opposition is to go all out in favor of anything. The man who will master the gentle art of understatement will be startled and delighted at the ease with which he can get others to become eager to come over on his side of the fence.

Advertising Techniques

Here are a few tips and kinks that may be of benefit in planning various advertising activities:

Magazine ads (*Organic Gardening;* health magazines), if "classifieds", need only forceful, succinct copy, usually no illustrations. Display ads are at least twice as effective if illustrated. Photos are proof positive. Art work gives attention value, distinction, an impression of quality. Whether for use in magazines or local newspapers, photos and art work must be planned in advance to fit the space decided upon. Photos must be clear, uncomplicated by unnecessary detail, contrasty, glossy-finish, and large—5x7 or 8x10. Photos cost more to reproduce than drawings, but their proof value is greater. Black-and-white, or "line" drawings cost less to reproduce than "wash", or other drawings having intermediate shades of gray. Gray-toned drawings take about the same reproduction rate as photos, the halftone engraving process being used for each. Pencil drawings, unless skillfully made by an artist who knows their limitations, are generally unsatisfactory for reproduction. Ads in color run into real money. When a



Unusual signs and displays not infrequently pay unexpected dividends in word-of-mouth or written free publicity. The above designs will serve as starting points for planning.

Simple line drawings materially increase the effectiveness of advertising copy. Making a few thumbnail sketches like those at the lower right is an aid in planning pleasing layouts.

clip-and-mail coupon is included in an ad more people reply. Plenty of white margin around an ad gives an impression of integrity and quality, especially if the message is short and the type is a bit smaller than average.

"Cuts", printing plates used for illustrations, if used for local-paper ads, can sometimes be re-used by the printer for illustrating other kinds of advertising matter. Smaller cuts can be made from the original drawing to fit letterheads, envelopes, etc.

Printed literature should be done by a printer, not by "office machine" reproduction methods. "Offset" printing is photo-lithography and does a good job at a saving in costs of reproducing illustrations. The cover of this magazine, prior to January, was printed by the "offset" method. Besides circulars, letterheads and so on, you should think about tags, labels, packages, and "stuffers"—how-to-prepare or how-to-store leaflets that are put in with the purchase to make sure the customer gets maximum satisfaction from the product. Incidentally, a friendly merchant might insert your circulars into customers' orders for a tactful consideration, say a few select organic products for his own table.

Make A Good Sign

Signs are wonderful salesmen—much more so than many farmers seem to realize. The big secret of successful sign advertising is to keep the sales message short and to the point. Ten words is plenty—the big national roadside bulletins stick to about that number. People whiz past signs or signs whiz past people; there's no time to read much. Don't scrimp on sign costs; nothing is more important to a food business than fresh-looking, trim, "appetizing" signs. Every effort should be made to place each sign that will be viewed at close range *at eye level.* Advertisers waste hundreds of thousands of dollars by neglecting to observe this simple rule. Signs that are to be seen from a distance can be up a little higher because perspective "pulls them down".

Illustrated signs generate real interest, and so do cut-out-background signs. A huge cement egg in a nest of cornstalks sold a lot of guess-what for one enterprising farmer.

Copy Is Important

Writing good copy is just another matter of exercising creative imagination and common sense. When we write copy we chew our pencils and strive for the prospective buyer's point of view. The idea is to *anticipate* his reaction when he first sees the ad, and then build on it. By figuring out in advance about what his first impressions will be, we have the opportunity to keep one jump ahead, and so lead him to the conclusion we wish him to reach. For instance, we know that his subconscious reaction to our ad is that when we have caught his interest we are going to laud our products to high heaven. When he finds that, instead of trying to sweep him off his feet with extravagant claims, we merely invite him to adopt a neutral attitude and consider with us a few features of our product, he cannot help being swayed by our display of fairness and by our recognition of his privilege of judging for himself. The impression we want to try to create in his mind is that this organic method seems to be a wonderful thing, but that we are right beside him, on his side of the fence, looking it over, and that we really ought to get together sometime soon and go into the thing together a little more fully; it certainly *seems* to have something on the ball.

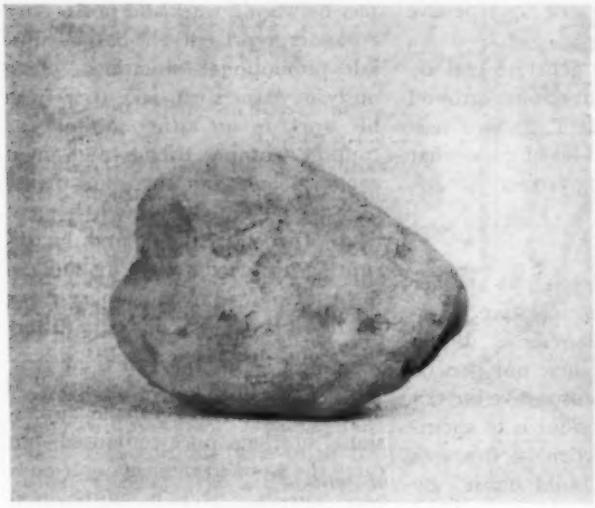
There are only two more important "secrets" of writing good copy. One is to use good round words that have weight in themselves and say a lot in a little space, and the other is to sharpen and condense the whole message to the smallest number of short sentences.

Contact Sells Your Product

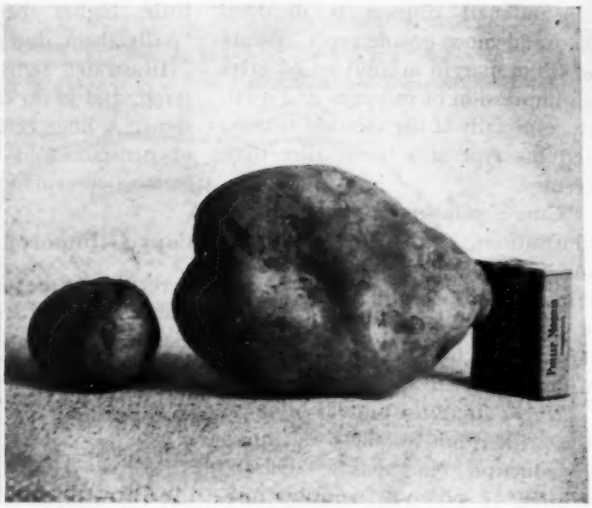
Direct selling, that is, direct contact between farmer and prospective customer, represents the best possible sales-promotional situation. Obviously no farmer can take time from his work to go kiting around the country winning friends and influencing people, but there are plenty of ways he can do himself a great deal of good without unduly disrupting his schedule and his budget. A little spare-time missionary work in the right places can and will pay the ambitious farmer well. Special group affiliations can be used to advantage. Friends in the professional brackets, once convinced, can carry the word to their many friends and clients. Health authorities, handled with due respect for their positions, can be turned into aggressive workers in your behalf. Vacationists are not only a wonderful summer market, but will carry the message back to their home states with them, to your everlasting benefit and credit. It would pay to draft a plan for covering local vacation resorts.

The technique of selling an idea orally is similar to that used in influencing opinion in an ad; there must be no appearance of attempting to convince or convert the prospect, and claims must be put forth as though offering them for consideration. A causal, friendly summary of the organic idea, plus an equally casual reference to *Organic Gardening* and *Organic Farmer,* plus an equally casual presentation of some of your own organically raised products is a powerful argument because of its very casualness. Incidentally, the more subscriptions to both magazines you can sell, the more homes your sales message will go to every month.

You won't be cutting your throat by "giving away" trade secrets, because there will be little competition in the field of organiculture for a long time to come. Many of your "contacts" will be part-time or even armchair farmers, who, though they cannot take time from their daily rounds to work the soil as much as they would like to, are actively in-



Unimaginative, poorly lighted record shots are of little value in modern advertising photography. Contrast this dull presentation of a potato, a horrible example both artistically and technically, with the photograph at right.



Sharp contrasts in size and lighting, plus the inclusion of a familiar object of known size, make this photograph tell a graphic tale and pose the question, "What's the rest of the story?" The advertising copy gives the answer, points the moral.

Planning Organic Profits

Continued

terested in keeping abreast of all phases of agriculture. Such people will always remember your generosity in telling them of your organic trade magazines. As for converting full time farmers—well, that's one of the greatest contributions we can make at the present time.

It is true that producing fellow-farmers perhaps do not represent the ideal market for organic food products, but it is also true that telling them about the organic method will well reward the organic farmer who will extend the unselfish hand of good fellowship by sharing his specialized knowledge. On the psychological side, the man who shares useful knowledge wins a unique reward: his instinctive desire to excel his fellow men makes him subconsciously increase his store of useful knowledge to compensate for the "loss" of the shared knowledge. And of course the "lost" knowledge is not lost at all, so that the man who shares his knowledge is actually increasing it. Our will to survive, to prove ourselves superior, is so strong that the more we give, the more we receive. Thus we progress and grow strong. As for material rewards for sharing our specialized knowledge with fellow farmers, we are laying up solid treasure for ourselves. In one sense, every fellow man is an actual or potential competitor of ours for the things that sustain life. Which man is our most desirable competitor, the man who had to make his own way to success, or the man who can date the turning point in his fortunes to our unselfish aid?

There are two techniques that are invaluable to the man who has an idea to sell. One is to think out, in advance, what the average prospect might object to about the idea—and work out, in advance, a simple remark that will prevent that objection from arising at all. For instance, the average farmer, when he first hears about organiculture, is very likely to make the snap judgment that the method might be nice for home gardeners, but impractical for a farm. But if we say something like, "I suppose you've already heard about the *practical* organic method for *professional* farmers?" we have by-passed a common objection. Moreover, we have paid due homage to his qualifications as a practical professional man, and by asking a question instead of coming out with a flat, categorical statement, we have conveyed to him our appreciation of the fact that he is a progressive man who keeps his ears open. If we leave him a circular or a magazine to look over later, we can be assured that it will be read with lively interest.

The other technique concerns the use of questions in selling either to farmers or consumers. Pleasant, casual, conversational questions have several uses in selling ideas. They bring out the degree of the prospect's information and interest in farm methods, nutrition, health, and nature, thus giving an index as to his likes and prejudices. With that information in hand, we can adapt our appeal to the man. Another advantage of the question method is that it stimulates the listener to ask questions himself—a very happy state of affairs indeed.

The organic method has whisked us all to the threshold of a bright new era. We owe it to ourselves and to the world to sell the organic concept, and sell it well.

Dairy

Rotate Pasture for Efficiency

Temporary pastures will stretch your manure

By WILLIAM P. COLEMAN

"THAT organic farming is great stuff," said a farmer, "for the man with surplus land, but most of us can't afford to take a field out of production to build soil fertility.

"I am speaking for the farmer with from 60 to 80 acres, with approximately one-quarter in natural pasture for six or eight cows or the equivalent in sheep. He requires so much land for hay, so much for grain, and perhaps the balance is given over to some cash crop. Every acre on a farm of this kind is fitted into producing the annual income and cannot be spared."

I believe that if a man makes up his mind to put some of his farm into soil building each year, he can find a way to manage, even if it means buying some hay and grain—especially when he can pasture the soil building crop for a season, thus eating his cake and having it, too.

For one thing, most natural pastures are on semi-swamp land which, in my opinion, might better be used for growing a timber crop. Cows and sheep are turned into these pastures year after year for 20 or 30 years and more, to eat coarse grasses that compete with the luxuriant weeds, brush and scrub trees. Just imagine the droppings that are wasted on such land during one season not to mention for decades!

Why not give these natural pastures over to seedlings that some day will become valuable timber? Why not set aside part of the farm for temporary pastures, plant them to legumes such as sweet clover, alfalfa, etc., and particularly the first. Sweet clover can be pastured for part of the second year, and the droppings will remain on the valuable field to be plowed under with the crop residue.

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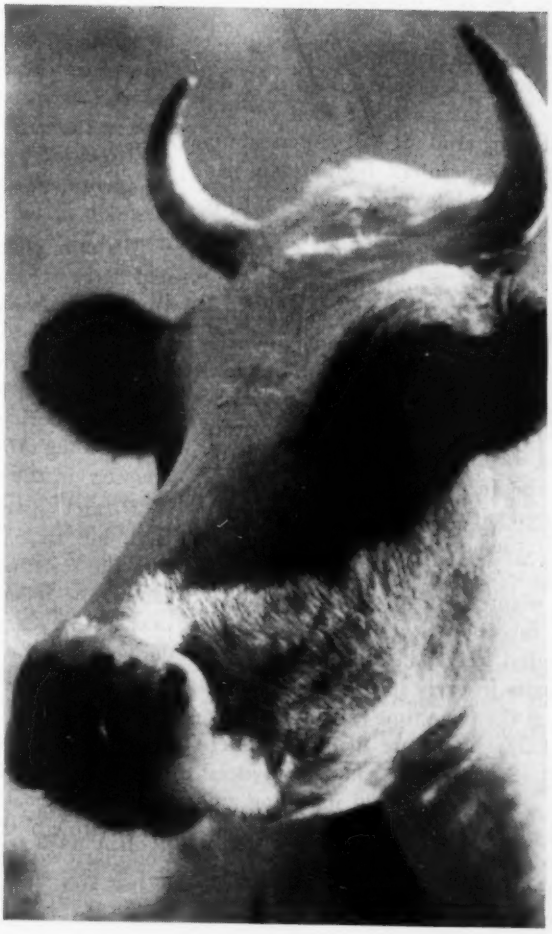


Get more fertilizer value from your cow by rotating her pasture.

An Organic Pasture Program *Continued*

Of course, cattle and sheep do sometimes bloat when pastured on legumes, but this can be avoided by giving them a full feed of hay and then putting them on the pasture. Once on legume pasture, keep them on it and see that they have access to salt and all the water they want.

We are interested only in the two biennial sweet clovers, the one known as common or white and the other as the yellow blossom. The yellow has finer stems and leaves and matures about two weeks earlier, but the white blossom sweet clover makes the heaviest growth, and that is what you want for pasturing and soil building. Under right conditions, livestock readily eat the white blossom sweet clover.

Sweet clover is one of the best crops for our purpose. When it is turned under, it will add nitrogen and organic matter to the soil and almost immediately it begins to decay and release plant food for the following crop. It will give an abundance of succulent, high-protein pasture in the late spring and early summer of the second year, but the carrying capacity begins to drop after full bloom during mid-summer and continues on through July and August.

Besides having the prime qualities of rapid decay and release of plant foods, the sweet clover improves the soil. It leaves a supply of moisture that was in the plants and roots, and it also increases the number of nitrogen gathering bacteria in the soil.

In the northern states, sweet clover is generally sown in spring, but can be planted as late as early summer. It can be sown just before the ground freezes in fall, and will germinate in early spring, but if planted at the same time as winter wheat, the tiny plants are likely to winterkill. Sweet clover can be broadcast on a small grain field in spring and raked in with the spike tooth harrow. Or it can be drilled in.

On poor, light soils, sweet clover should be sown alone, as the land probably can not produce a nurse or companion grain crop. On good soils, it is usually put in with a nurse crop to get the utmost out of the field. Also, on good soils, the seed can be broadcast on the snow in March or April when the ground is alternately freezing and thawing, and the soil will cover it. The pioneers favored this method.

To assure having a pasture with maximum capacity and longer life, sow orchard grass with the sweet clover. Use 12 to 15 pounds of sweet clover seed and five pounds of orchard grass seed to the acre. The livestock will eat the sweet clover right along with the grass and keep it from growing rank and bitter. Livestock will positively refuse sweet clover after it becomes bitter.

A Michigan farmer bought a piece of crop land that adjoined his farm. The price was very low and so was the soil fertility. He spread lime, plowed the field and in August sowed it to rye. The rye was disced in the spring and the field was sown to biennial sweet clover.

"It's only about half a stand," he said later in the year, "but that's all right, considering it is a light, sandy soil. It is drawing free nitrogen from the air and saving it for my next crop. The large, fleshy tap roots are boring four or five feet down through the clay and hard pan, opening up the soil.

"I can't spare manure for this field, but that crop will put more into the soil than all the manure I can scrape together. When I plow next spring, the plants and roots will decay almost at once and provide humus, minerals and nitrogen for my next crop."

It was too wet to plow in the spring, and the sweet clover was not turned under until May. It was a heavy growth then. The field was well harrowed, then drilled to soy beans and cross drilled to sudan grass. In early August when the beans were stocky and the sudan grass attained a height of three feet or more, the field was turned under. It went back into rye for a winter cover crop and green manure.

In spring after the rye was plowed under, the field was seeded to sweet clover and broome grass. The clover made an excellent stand, a great improvement over the first planting. Late in the following spring when the new growth of clover and broome was up about eight inches, the farmer gave his cows a whopping feed of alfalfa hay and immediately turned them on the pasture.

"A grand pasture," he remarked, "and it will put milk into the pail."

It proved to be only a partial pasture, however, for the cows preferred the broome grass. They nosed the sweet clover out of the way and wrapped their tongues around the broome spears. The clover, thus ignored, grew so rank and bitter that it was no longer palatable when the grass had been grazed down.

"That pasture backfired on me," said the farmer in July. "I was sure they would eat the broome and clover together as they do the clover and orchard grass. Even better, maybe. I've pastured better than four cows to the acre on clover and orchard, but I have learned that it

PERMANENT PASTURES LIKE THIS ONE ARE WASTEFUL OF MANURE AND OFTEN ARE HARD TO MANAGE.

doesn't work with broome in the mixture."

Another farmer who has had long experience in pasturing on grass and sweet clover mixtures, keeps close watch on the pasture for the first few weeks. If the cows fail to keep the sweet clover grazed down, he raises the cutter bar on the mower to leave an eight inch stubble and mows the field. The clover plants thereupon send out new, palatable growth from buds in the axils.

If I had a choice between overgrazing or undergrazing a sweet clover pasture, I'd take the former. Overgrazing shortens the life of the pasture, but undergrazing is sure to permit rank growth of the clover, which increases the bitter content. If the clover has already gone into bloom, mow it to leave a stubble of 10 to 12 inches instead of 8 inches.

Since sweet clover is somewhat difficult to cure for hay under any but the best conditions, there is not so much temptation to take it for hay. When cut just before bloom in the second year and properly cured, it is the equal of alfalfa hay.

But, because a high stubble must be left to insure continued growth of the plants, the sweet clover is usually harvested with a grain binder and put up in long, loose shocks to prevent excessive loss of leaves.

When cut with a mower, the sweet clover must be raked into windrows as soon as the leaves begin to wilt. It can be left in the windrow to cure or can be cocked, but sweet clover leaves shatter under the slightest handling after they become dry.

The biennial yellow blossom clover with its finer stems and leaves, makes a good hay. But who wants it? Most farmers shy away from sweet clover hay from fear of the so-called "sweet clover poisoning" of cattle and hogs, particularly the young stock.

Sweet clover poisoning occurs if the sweet clover hay is fed without other hay for too long a time. The infected animal's blood will not clot and death may occur from internal hemorrhages or even from a cut or gash that draws blood. It is considered safe to feed sweet clover hay about three weeks, then switch to some other hay for three or four weeks. It is then safe to again feed sweet clover hay for another three weeks period.

Now and then some distracted farmer who finds his silage corn doesn't stretch, will put the sweet clover into the silo. But making silage of this plant is a nuisance and a gamble, more often than not.

Because of its succulence, it may make a soggy, unpalatable feed unless the excess juice can be drawn off at the bottom of the silo. If made when the plants are too mature or too dry, it requires the addition of water; otherwise it is fluffy and very difficult to pack and is likely to mold.

Taking the crop for seed is another gamble, as there is no really satisfactory method for harvesting the seed. Further, you will often find the upper parts of the plant still in bloom, while the lower branches are heavy with mature seed. When rank, sweet clover is very hard to handle with a grain binder, and the combine finds it much more difficult to handle than small grains.

The seed harvest is usually undertaken when two-thirds to three-fourths of the seed pods have turned brown. If you harvest earlier, you will have considerable immature seed; if later, the pods shatter and you lose seed. The immature seed must be removed immediately after harvesting or it may cause heating of the mature seed.

Sweet clover, you might say, as a hay, silage or seed crop is a big pain in the neck. But for the job it can really do, which is putting fertility into the soil—it just can't be beat!

Machinery

Fertility Is More Than S

Subsoiling can increase your soil's natural fertility

By ARCHER P. WHALLON

SOME cynical philosopher from Mars might well be amused that earthly humans should in self-conceit babble of "moving mountains with atomic power" and plan rocket ships to cleave the stratosphere to visit the moon, and be at the same time so complacent in their ignorance of what takes place in the thin earth's crust under their feet. But it is upon this thin earth's crust, the layer of topsoil, too often but six or eight inches thick, that human life depends, and people in all stations in life are belatedly beginning to ask if this topsoil is really thick enough for its job. It must be admitted, that over these United States, as well as over the whole cultivated space of the world, such a thin and often misused topsoil, spread out over a hard and impervious subsoil, to dry like a carpet on a floor, is not enough to assure continued profitable agriculture and human welfare.

Recurring floods and droughts and all the misfortunes of water and wind erosion are giving us to understand that we must build up a far thicker and more fertile top layer of the soil and must break up and destroy the natural or artifical barriers between the topsoil and the subsoil beneath it, so that we may increase the water intake and holding capacity of the land. To a large extent, this means the correction of an artifical or man-made line of cleavage or separation between topsoil and subsoil that should never have been made in the first place—the creation of a plowsole or hardpan by repeated shallow plowing with the moldboard plow at approximately the same depth.

But "plowman's folly" cannot be blamed with all the troubles of water and wind erosion. The slaughter of our primeval forests over the once heavy timbered regions is also a contributory factor. Also, on virgin prairie there is more or less a natural hardpan, a too compact subsoil and a topsoil too thin for

A CHISEL SUBSOILER OPERATING IN AN ORCHARD.

Skin Deep

sufficient water intake and retention. The early Spanish and French explorers of the Mississippi valley and the Great Plains region wrote of vast floods and withering droughts long before the coming of the white man's plowshare.

At the start, it should be plainly stated that subsoiling does not mean deep plowing in the sense of a complete reversal of the soil strata by the moldboard plow. Often it might better be regarded as an operation of a "contrary" nature, the deep subsoil or chisel tillage of the land being followed by shallow plowing, discing, stubble mulch, or some other type of surface cultivation. The land may also be left in sod or vegetative cover following subsoiling. The basic idea is to get more water and organic matter down deeper into the soil, and to disturb the land's surface as little as possible. That is the primary objective of subsoil tillage, to get and keep more water in the land where it will be available for plant growth when needed.

The rains fall and the snows melt, but the too thin topsoil can absorb but a small quantity, and the larger share of the surface water, unable to penetrate the hard plowpan and enter the subsoil, runs off in floods, taking a toll of the land's plant food. There are also many places where the surplus water, unable to penetrate the hardpan, does not run off quickly enough for the good of the growing crops and soil life, and such standing flood water may be injurious or fatal to crops and soil organisms. And still it can often be, that this lost or injurious flood water, could it have been held in storage in the soil, would have been of great value to the growing crops in the dry season but a few months later. So it is, that subsoil breaking that increases the water intake and storage capacity of the soil, serves as both drainage and irrigation.

In common parlance, the word "subsoiling" has come to mean working or cutting up the land with a subsoil chisel or "killifer", usually from 16 to 30 inches deep, but in exceptional cases, and with heavy single chisel implements, to a total depth of over five feet. The power requirements for these heavy deep-working tools are obviously high. Sometimes the combined power of three of the biggest tracklayer tractors is needed. But for the lighter tools, with a single chisel, penetrating up to 30 inches deep, the power of the ordinary wheeled two to three-plow farm tractor is usually sufficient.

These tools, of which there are several makes, are simple, strong and rigid affairs, having heavy steel frames mounted on two wheels and fitted with some kind of mechanical or hydraulic tool lift. They may carry one, two, three or more land chisels or subsoilers, as desired. Some of the larger implements, with but a single standard or subsoiler, can be provided with a conical ball or torpedo-shaped member which follows the point of the chisel and presses the subsoil apart to form drainage passages through the soil. This type of implement has long been used in England and on the European continent, where it is known as a "mole plow". These mole drains in stiff clay subsoil have been credited with effective service for over twenty years. Mole plows have been made that form drains eight inches in diameter, but the larger number are of about half that figure. "Gopher plow" is the corresponding California term, and most of the American subsoiling and mole drainage implements are of original California conception.

Plainly, the cutting up of the land with a single deep running land chisel, with cuts spaced from six to a hundred feet apart, is an entirely different operation with a different objective, than tillage of the land with a heavy cultivator or ripper with six or more teeth, although the latter may work to a depth of 16 inches or more. The former, while cutting channels for water intake and softening the soil to facilitate root growth, will disturb the topsoil but very little, and it is often an operation advisable for grassland and pasture renovation and for sod mulch orchard treatment. The latter, working with the heavy multiple tooth ripper or cultivator, breaks up nearly the whole of the soil's surface and may be a substitute for plowing preparatory to the planting of a crop.

These tools have but two features in common, that of going below the plow-sole of ordinary plowing depth, and of bringing but relatively little of the subsoil to the surface. Both types of operations have their rightful place, which can only be determined by a study of the land and objectives.

Fertility Is More Than Skin Deep *Continued*

It is as true of subsoil treatment, as of all other tillage operations, that each farm and field has its own peculiar problems which must be studied and answered on the spot. The time factor is to be considered, but there really is no definite time or season of the year when subsoil breaking is most advantageous. It can be carried out at any time when the land is not frozen or covered with a growing crop. In some instances it is advisable to subsoil at the driest time of the year, during the late summer or early fall months, that the subsoil cuts may be open to receive the water of the fall rains and winter snows.

A few basic principles have some general application, the first being that on land that is at all hilly, subsoil tillage should follow the contour of the land. Experience in the rolling lands of the Walla Walla region of the state of Washington, indicates that chiseling on the contour of lands of as steep a grade as 40 per cent, effectively stopped water runoff and prevented gully erosion. Plainly land of a steeper grade than this should hardly be called agricultural land, and there have been a few instances where excessive subsoil chiseling, making the cuts too close together on steep grades, has defeated its purpose and caused land-slides.

While separate subsoiling and chiseling must occupy the first place in this general scheme of subsoil renovation and water and fertility conservation, there are also vast possibilities in the extension of simultaneous plowing and subsoiling. This idea also is nothing new, for over a century ago farmers were well aware of the deleterious effects of the formation of the hard plow-sole and they sought means to break it up. The more simple and primitive method was that of running a separate subsoiling implement, a simple tine or coulter in the bottom of each furrow before the next furrow was turned.

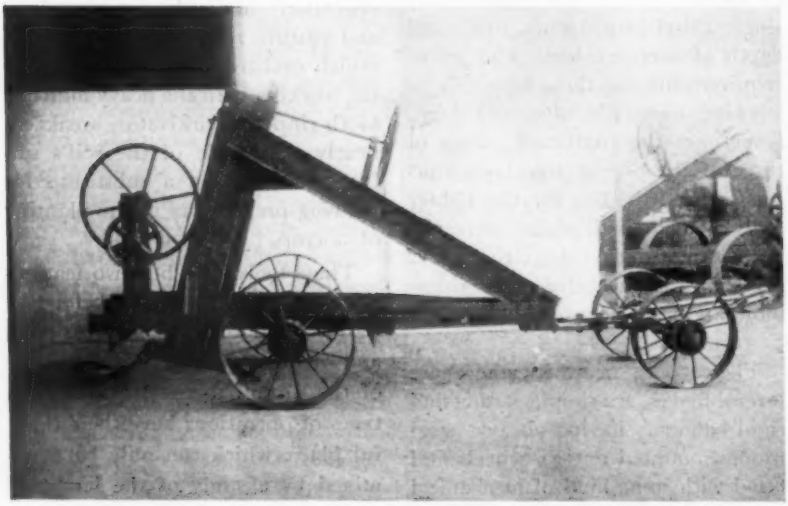
This was a slow and laborious process, and the next step was the attachment of a subsoiling tool to the plow's bottom, so that the combined job could be completed at one time. This greatly increased the draft of the implement, and although horse drawn plows with this attachment are still in use, the limitations of the power of draft animals long retarded the extension of subsoil tillage.

The coming of the tractor really made combined furrow-turning and subsoil breaking plows practical. Now many British and continental European tractor plows can be furnished with some kind of subsoil chisel or ripper. Most of the British subsoiling attachments are simple hooks or tines that extend down about four inches below the plow bottom, but the German devices are more often small moldboard plows that may turn nearly all of the furrow bottom.

Some years ago a very heavy three-furrow plow with superimposed shares of this type was made in California, designed for plowing sugar cane land in Hawaii to a depth of thirty inches. Now one of our large full line farm machinery companies is actively marketing a very efficient combined furrow turning and subsoil breaking tractor plow of this type. It is not unreasonable to expect that the development and use of such implements will be greatly increased and in time, the formation of a definite hardpan or plow-sole through the pressure of the plow's bottom will be largely a thing of the past.

The use of explosives to break up a compact subsoil is also no very new idea. It has been in use for forty years or more. It is of advantage where land chisels or subsoilers cannot be used due to the presence of fixed underground rocks or tree roots, and where subsoil tools and the tractor power to pull them are not available. It has the further advantage of low first cost, as there is no big investment in heavy implements, and it can be used where such heavy machines cannot be taken. But it is slow, and there is the repeated cost of labor and explosive used to be considered.

Small charges of dynamite are detonated in holes punched in the soil at intervals and at the required depth. The amount and kind of explosive to be used and the spacing and the depth at which the charges should be placed are all matters for the expert and experienced man on



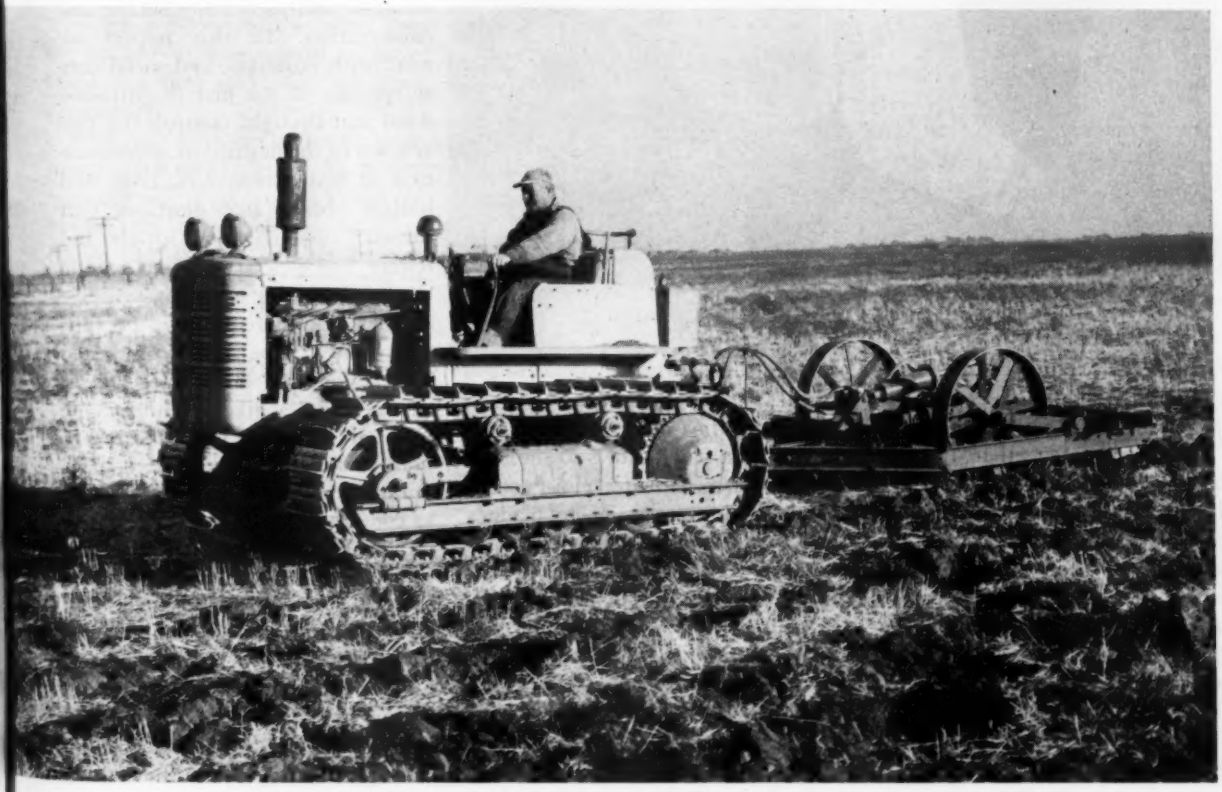
Large mole drain plow made by the Killefer Corporation.

the job. The manufacturers of explosives are able to furnish information and experienced operators. In competent hands, this method does not blow holes or pits in the surface of the soil but breaks up and softens the subsoil, increasing its capacity for water intake and absorption and making it more easily penetrated by root growth.

There is nothing incompatible in subsoil blasting and mechanical subsoiling; in fact, in some instances the two have been advantageously combined. In a Missouri orchard, where the ground was first prepared for tree setting by exploding two sticks of 20 per cent slow dynamite three feet deep in the ground, the area between the trees was broken up with a subsoiler that also went down three feet. This combined operation made an excellent root-bed for apple tree growth that held a reserve of moisture through the dry season. The question naturally arises, if subsoil blasting might not be injurious to beneficial soil organisms, earthworms, bacteria, or plant life, either through shock or by the action of noxious fumes resulting from the explosion. However, no evidence that subsoil blasting is in any way injurious to soil life has been observed.

The idea of subsoil improvement by means of plant root growth can well be regarded as an accompaniment or supplement to other methods of subsoil treatment, and it is also something of the nature of their final fulfillment and objective. It has the unique advantage of itself yielding a profit from the crop grown above ground at the same time that the subterranean root crop is adding to the fertility of the soil, increasing its water intake and holding capacity and preventing runoff and erosion. These efforts are at the basis of large scale plans for flood control of river systems through reforestation of surrounding watersheds.

But these plans, while commendable, are slow of practical realization—it takes years for tree crops and forest to grow. A combination of mechanical subsoiling and the growing of deep-rooting legumes can more quickly be effective in preventing water runoff and erosion. Any farmer who has plowed a sidehill of old alfalfa sod, with his tractor front wheels rearing up and his plow pulling up alfalfa roots a half-inch thick and five feet long, has been rather unpleasantly convinced of the soil penetrating, holding, and erosion preventive value of the plant. He can plainly see how these roots, as they decompose, are putting organic matter down deep into the subsoil, and how they leave channels to facilitate water intake. Alfalfa and sweet clover have long been the standard plants for this soil conditioning service, but some other legumes may prove to be of comparative



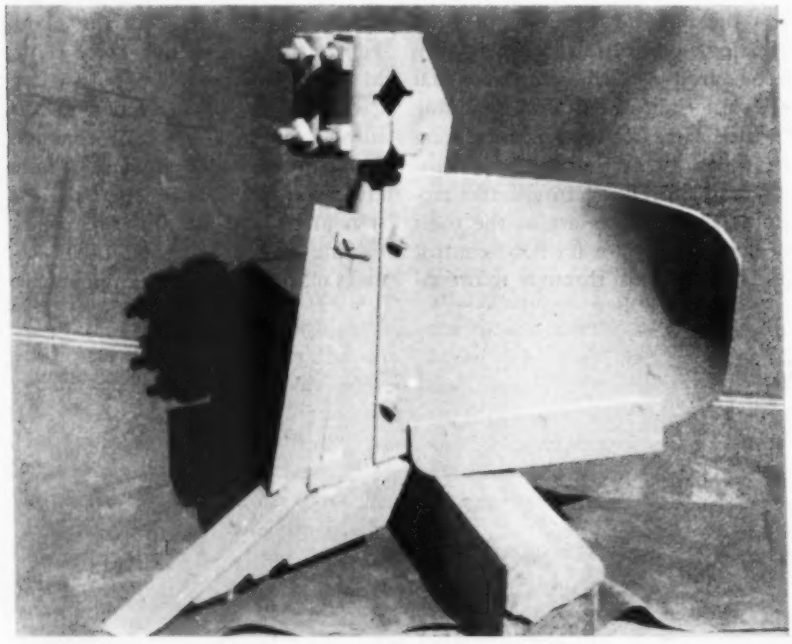
A POWERFUL TRACTOR IS OFTEN REQUIRED TO PULL A DEEP RUNNING SUBSOILER.

Fertility Is More Than Skin Deep *Continued*

value. A three year old stand of Ladino clover at the University of Illinois Agronomy Farm at Urbana was found to have developed a root growth penetrating five feet deep.

To date the subsoiling value of plants other than the legumes has had little consideration, but some non-legumes, particularly the Brassica, present interesting possibilities. This has been demonstrated in the unique cropping schemes of Col. C. M. Blake, in Gallia county, Ohio, in growing combination crops of kale, sweet clover and vetch. There it has been noted, that the kale plant in addition to withstanding winter temperatures, develops a deep-searching main root system, roots having been excavated to a depth of five feet, and as the interior of the kale root decays more rapidly than the hard exterior, these roots form drainage tubes reaching deep into the ground.

Undoubtedly too, some of our major farm crops could contribute more to subsoil improvement through root growth, if that growth was not dwarfed and turned aside by an impervious hardpan. Wheat roots, for instance, can penetrate four to five feet into the soil in search of moisture, as has been demonstrated in a four year test in southwestern Saskatchewan. Studies made at the Swift Current Experimental Station show that the average yield of wheat on sandy soil increases with the depth of soil moisture at seeding time. Wheat planted in soil having but 18 inches of moist soil at seeding time made a crop of only eight and a half bushels to the acre, while that seeded in a moist soil of a depth of over 44 inches made a crop of 20 bushels or more.



A Laird subsoil chisel with shank and wings.

It is pertinent to observe, that the prompt seeding of deep rooting subsoil penetrating plants following a mechanical subsoil breaking is advisable to take full advantage of the open and root-growth inviting conditions of the soil and to lengthen the intervals between subsoiling operations. With this objective, effective rotation systems growing grain and legume crops, have been worked out, particularly in the hilly and rolling lands of the Pacific northwestern states.

Some scientific investigators of the soil contend that it is very advantageous to increase the air penetration of the soil and the study of soil-air has had the attention of a progressive school of soil chemists and biologists. It is beginning to be understood that the proper air content as well as water content of the soil column is necessary for maximum plant growth. Air spaces, while they have much to do with the capacity of the soil to hold water, have further benefits also. They admit oxygen to the soil and permit the escape of noxious gases. Oxygen is essential to the germination of seeds, and plant roots breathe as well as does the leaf system above ground.

But interesting as these questions of soil-air and organic life are, for the major consideration of value in subsoil tillage we must return to the factor of increased water intake and conservation. In this respect we meet with economic and social considerations of the first magnitude—flood and drought control, the prevention of the destructive sedimentation of water reservoirs, river and harbor beds, water shortages that threaten our irrigation supply and reduce hydro-electric power generation, dust bowls and forest fires,—all these and more of the evil results of erosion can be largely prevented by making our land more like a sponge and less like a funnel. One can well think, that of the many millions of dollars that have been spent building levees and other measures to confine the waters of the Mississippi and its tributaries, and in the construction of irrigation water reservoirs, equal or better results in flood and drought prevention would have been attained by a large scale subsoil breaking and topsoil building program—and a lot of our farms would have been made twice as big in crop production ability by making them twice as thick.

Letter from an Orchardist

An apple grower reports success with the organic method

Dear Sir:

During the winter months a farmer catches up with his reading. In this manner while reading the July issue of O. G. I noticed an invitation for persons operating their orchards organically to register with your publication.

While we are definitely on the road we have only reached the stage of abandoning chemicals completely on about 15 of our 200 apple trees. We have under organic handling 1 tree for a period of 3 years, 30 trees for a period of two years, and 40 trees for a period of one year. For the balance of our orchard we have taken the first step, that is, sheet composting.

While we have not followed your instructions to the letter this is not because we think our method is better, but at present it is the nearest we can come to it with the materials we have on hand and still continue to produce a profitable crop. Our compost is composed of cow, sheep and chicken manure with liberal amounts of hay, straw and sawdust used in the bedding and litter to furnish the green matter. These have been applied when either well rotted or half rotted, as time would permit. For mulch material we used either sawdust or straw.

The enclosed photo is of the one tree that was started on organics three seasons ago. During the winter of '47-'48, a 4 to 6 inch layer of our compost was applied. During the spring of '48 we added sawdust on top of this till we had a mulch of from 7 to 9 inches. We have added more sawdust on one occasion to maintain this depth. While we carried a regular commercial orchard spray program on all our trees, during 1948, we began to reduce the amount of spray applied to this tree and also reduced the number of sprays it received. During this season the foliage and fruits of this tree did not materially differ from

The apple-laden branches of one of Mr. Engelmann's trees.

others of this variety in the orchard.

In 1949 it was given one spray of Elegtol and one of dormant oil before any leaves or blossoms showed forth. From then on no sprays were applied until August. At that time this entire block of Delicious trees became infested with red mites. Along with all the other trees the "Organic Tree" received an application of D.N.111 since it showed no superior resistance to the mites.

At harvest time, checking the produce of this tree with the others, it was found that the number of apples it carried was equal to the best production of any tree in the entire block. Several of the other trees matched production in numbers of fruits produced.

However the apples on the "Organic" tree were larger than that of any other tree regardless of the number of fruits within the same variety. We have always heretofore found that the size of the fruit produced was always reduced as the number of fruits produced was increased. The experimental tree disproved that theory. The finish of the fruit and color was unmatched by any other Delicious tree. The foliage was in better condition and color and terminal growth were tops. On the grading table the "Organic" fruit scored approximately 85-90% clean. It was a revelation to find a total damage of less than 15% from scab and codling moth with not a drop of poison or fungus protectant. Our percentage of clean fruit for the orchard as a whole was also about 85-90% in spite of 12 sprays applied. One variety of which we have but ten trees ran as low as 50% clean fruit. There seems little reason for relying on spraying when with three sprays we ran a score 35-40% higher than with twelve sprays.

Each season we are starting a few more trees to our organic group. Someday we'll be able to register 100% converted.

Frederick A. Engelmann
Commack, N. Y.

Another Look At Trace Elements

CONCLUSION

By LEONARD WICKENDEN

IN PART Four of this series, it was suggested that manures and composts contain substances, other than trace elements, which assist the plant in manufacturing its food. There is another possibility which must not be ignored. D. R. Hoagland, writing in *Chronica Botanica* (pp32-33) in 1944, states that when deficiency diseases occur it is not a question of the required element being non-existent in the soil, but rather of its being insufficiently available. "In other words", he writes, "not enough of the element can be absorbed and distributed in the plant for its physiological needs."

Organic Matter Releases Trace Elements

Perhaps we have, here, a clue as to why manures and composts prevent deficiency disease. We have seen, as Mr. Wischhusen told us, that reports from England stated that "comparatively small amounts of organic composts produced dramatic and lasting effects", and in the same paper he writes: "Strangely enough, healthy orchards . . . . contained a preponderance of fungi, whereas in affected orchards the soil microflora were predominantly bacterial." Perhaps not so strange, at that. Were not the fungi, which live on decaying organic matter, producing antibiotics which kept the trees healthy?

Dr. Nikitin puts the matter more plainly. He says: "The presence of humus organic acids in the soil results in ready solubility and availability of such nutrients as manganese, iron and boron." Perhaps, then, all this talk of the need for adding trace elements boils down to the need for adding organic matter to make trace elements available. Admittedly, when the soil in this country was first cultivated, crops were healthy. If they needed trace elements, they found them in the soil. The amount of any trace elements that a crop removes is exceedingly small; 2 pounds per acre would be a high figure. In 100 years, assuming that absolutely nothing was returned to the soil, the loss of the trace element would amount to 200 pounds.

We have assumed that a furrow slice weighs 2,000,000 pounds to the acre. If we include a reasonable depth of subsoil, say 24 inches, the weight per acre would be somewhere near 10,000,000 pounds. Two hundred out of a total of 10,000,000 is 0.002%. If it takes 100 years to lose that small amount under the extreme conditions of nothing being returned to the soil, it is difficult to believe that our soils, which are still very young compared with those in other parts of the world, have been depleted of their total original content of trace elements. Perhaps, then, instead of adding soluble chemicals to our soil, we should be adding materials which would liberate supplies already existing in our subsoils.

Hydroponics Replace Agriculture

The subject cannot be left without mention of the soil of the Everglades area of Florida. This is the prize exhibit of the micronutritionists. Before chemicals were added, the fertility of the soil was low, crops were sparse and unprofitable. With chemicals, including trace elements, production has been tripled. But let me quote Louis Bromfield in *Malabar Farm* (P. 308):

"On a recent visit to the area, the county agent who conducted me on the tour warned me in advance of the conditions, saying: 'Of course, what you are going to see is not really normal agriculture, but only stimulation which must be repeated at frequent intervals.

Where, then, do we stand on this a glorified form of hydroponics.' In other words, the virgin muck soil was simply the base for operations, as gravel and cinders are the base

for growing plants in water saturated with minerals."

Here, then, we have the laboratory sand-boxes on a large scale and the plants growing under highly artificial conditions. If we have been hasty in drawing conclusions from the small tests, why are we not equally hasty in doing so from the Florida Everglades experiments? Once again, we are starting with the sick plant and dosing it with cures, and the doses must be administered every year and sometimes more than once a year. It is surely rash to assume from results obtained under such wholly abnormal conditions that similar "cures" are needed wherever agriculture is practised.

Suppose, however, that the micronutritionists can explain away the state of Washington and that diligent searching in other directions fails to disclose a soil, deficient in trace elements, in which plants grow healthily. We then decide that the odds are overwhelming that such elements are, indeed, essential. Shall we supply them in the form of soluble sulphates, borates, iodides and so forth? If we do, there seems to be no escaping the fact that we shall be faced with all the complications briefly outlined in these articles—with possible toxicity, with elements thrown out of balance by conditions beyond our control, with the need for holding acidity within narrow limits and the necessity for what Mr. Wischhusen calls "a suitable balance between the relative rates of oxidation and reduction". I can see how such conditions could be obtained and held in laboratory experiments, but I cannot believe it would be possible on the large farm—or, for that matter, on the small one or even in the backyard garden.

Soil Balance Is Affected By Soluble Trace Elements

I believe that all these difficulties, which seem so fantastic to me, arise from the fact that the chemicals used for supplying the trace elements are too soluble. Because they are soluble, they react too quickly, they throw one another out of balance, they reach a toxic concentration too easily, they are too readily leached from the soil and so must be frequently renewed.

What is the answer? Nature has never encountered this dilemma, so why not look to her for guidance? She has never sprinkled borax, or manganese sulphate, or zinc sulphate on the soil. Wherever these trace elements occur they have come from rocks and have been slightly and slowly soluble. If, then, we decide that we are drawing these micronutrients from the soil faster than nature is replacing them, why not add them in the form of pulverized rocks? The only objection I have met to this procedure is that solution of such materials takes place too slowly, but there is plenty of evidence to show that if it is added in a state of fine division, the rate of solution, in the presence of ample organic matter, rises enormously.

There are those who even advocate a coarse grinding rather than a fine one. Dr. W. D. Keller, in his important article in *The Scientific Monthly* for February 1948 (which deserves far more attention than it has received) also suggests the likelihood of increasing availability by calcining—that is by heating to high temperatures. Surely, such a procedure is far sounder, far more intelligent, than adding highly soluble chemicals (as is now done in Florida), which are rapidly lost by leaching,

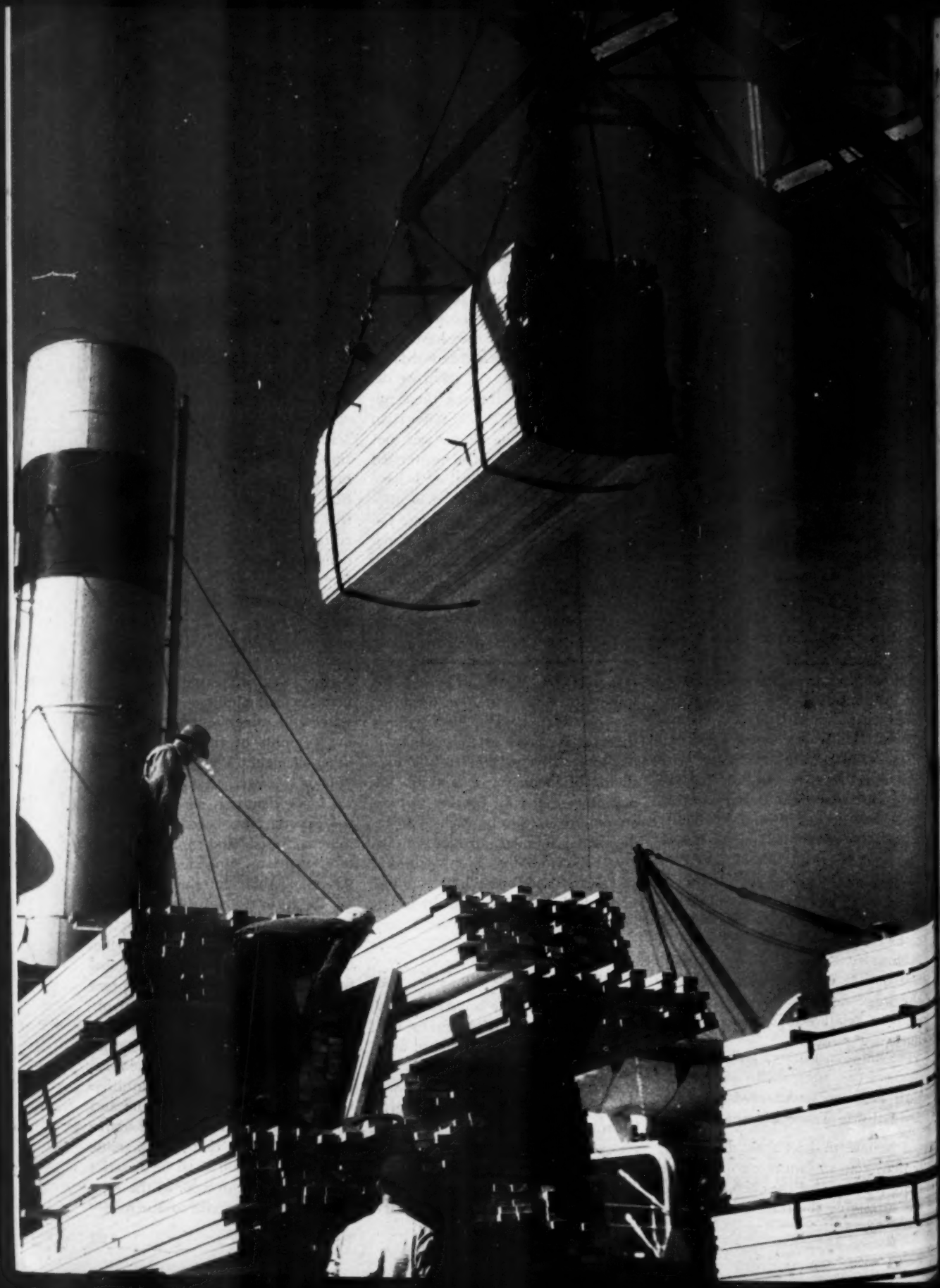
Nature Knows Best

Give Nature the materials and leave the control of them to her. She's had far more experience at it than we have and, all in all, has made a swell job of it without a single chemist to help her. We can give her rocks that contain potassium and phosphorus as well as calcium, magnesium and a line of micronutrients. The benefit from such rocks will be long-lasting and not a temporary matter of trace elements? Let us admit that all of us, or almost all, have been too easily credulous. The early demonstrations of the micronutritionist fascinated and delighted us. They were as good as magic. The plant was yellow and sickly; the magician added a tiny pinch of his magic powder and presto! the plant turned green. But too often the magic did not work. It was wonderful when the rabbit came out of the hat alive and kicking, but sometimes it came out dead and there was no magic left.

When the magician tried to explain his failure with talk of nutrient-element balance, and control of acidity, and relative rates of oxidation and reduction and manganous-manganic equilibrium, our disillusion became complete. What did all this mean in practical terms to the cultivation of our farms and gardens? It seemed to us we had better forget the magic and, both literally and metaphorically, get down to earth.

Were we right in this? Perhaps. But perhaps not. It may still be that Nature, in this complex business of manufacturing plants out of air, water and minerals, may need minute amounts of this, that and the other element. We don't know. A year or two back most of us thought we knew definitely, but since then the experts have become more and more confused (and confusing), hesitant, cautious, uncertain of themselves and their doctrines. The bigger the men, the more cautious they have become.

So let us wait and, in the meantime, put our faith in what we know will work. If, finally, the proof comes through, or if the circumstantial evidence is so strong that it convinces us, let us then insist that trace elements be added in the form of pulverized rocks of low solubility. Let us insist that soluble salts and soil are incompatible. And, above all, let us insist that laws against poisons to our soil shall be as strict and as strictly enforced, as the laws against adding poisons to our food.



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Appraise your trees carefully and you may find

Dollars in Farm Woodlots

By NASH CHANDLER

A New Jersey farmer at his death several years ago left a considerable area of timberland to his two children in equal shares. The son sold his share to a near by saw mill operator for a lump sum of $4200. They stripped every tree and the ground was a shambles of rubbish.

The daughter called in a State Forester, under a co-operative plan, and an expert's appraisal of her share resulted in the marking of about fifty per cent of the stand. The marked trees, and nothing more, were sold to the same lumberman at $31.50 a thousand board feet. She received $9,000, or more than twice the sum paid for her brother's share, and she still has an excellent grove of timber left. This is specific proof of what often happens where the owner of relatively small holdings of wood decides to turn it into cash.

The state of New Jersey has faced the problem with a refreshing awareness of what is meant by public welfare. The state's method of "intervention" would appear to involve a battle-royal with commercial wood-using industries, but such is not the case.

Logging interests, which in New Jersey are mostly well established and permanent units, have accepted state supervision of private woodlands as bringing two advantages. The large estate owner who hitherto would not allow a logging crew on his place for fear of maltreatment of his forest, now can negotiate sales of merchantable trees, knowing that the process is under skilled control. It brings to the market a timber supply formerly walled-off in private

Ewing Galloway

If possible, have an accredited timber agent inspect your trees and secure a bid from a lumbering concern.

Don't keep your lumber on the farm if you can turn it into a cash crop.

Ewing Galloway

Dollars in Farm Woodlots

Continued

sanctuaries. Thus the mill operator has a new sense of security in an assured forest resource on the technically managed farm woodlot. The prices paid to the woodlot owner, who follows the advice of the state foresters have risen to $25.00 a thousand feet on the stump, and often much higher.

Always Have Your Trees Appraised

The financial status of the operators does not appear to suffer. The owner of a twenty acre New Jersey woodlot was offered $300 for all trees the logger wished to cut. Instead of accepting, the owner had the State Forester mark just forty per cent of the wood volume of his property. No trees under twelve inches were marked. The sale of the marked trees brought a net profit of $707.00 and the owner still holds sixty per cent of his wood volume for future use.

Woodlands of northern and central New Jersey produce a variety of Oaks especially adapted to the needs of the ship-building industries for barges, ferries and tugs. The usual cutting practices of commercial mills degraded the oak forests by removing only the best and leaving the poorest to reproduce. In Southern New Jersey the highly active basket industry uses great quantities of yellow poplar for fruit and vegetable containers. With a hit-or-miss cutting, large areas in the lower Delaware Valley, once so prolific in poplar, have degenerated to worthless soft Maple, and the essential Yellow Poplar has to be imported.

Obviously, New Jersey was on the way to a black out in her forest industry unless the expanses of wooded domain covering forty-five per cent of the state were brought under rational silvicultural management. By no means has this been achieved. In the nine years or more of operating the program of state help to the private woods owner, over three thousand owners have brought nine thousand acres under the plan and nearly fifteen million board feet of timber have been marked and sold. That alone is some achievement.

In the view of New Jersey's foresters, even the most patient and intensive campaign to make the farmer a self-starter as a woods-manager is not apt to show positive dividends. The gaps between theoretical knowledge and a plan of intelligent action too often cannot withstand the cash temptation buyer's offer to take the woods off the owner's hands, and unfortunately that means his sucessors, too.

Most farmers are shrewd concerning their field crops and livestock, but they are not usually foresters or an alert merchandiser of wood products. However, they are generally open minded on any demonstrated scheme that assures them higher income.

It is on the receptiveness of farmers to practical demonstration in money making that the Forest Service of New Jersey bases its plan of campaign. News spreads quickly if any one sells half his woodlot for twice the money offered him for the entire tract, and applicants by the score for State Forestry supervision, far beyond present facilities to handle, is due to such case histories of what a forester can do with a piece of forest.

A Timber Agent Will Protect Your Interests

A far-sighted provision, which must have been devised by some one with a knowledge of political hazards relates of a bargaining intermediary known as a Timber Agent. While the State Forester marks an owner's trees for cutting, taking care to preserve a maximum residual stand, the state stands clear of the succeeding processes. An independent and trusted agent carries on from there. He calls for bids from commercial operators on the wood volume of a property as scheduled by the Forest Service. He supervises the cutting and does the scaling. In the event of a logger appropriating a few unmarked trees, the agent can penalize the cutter at a maximum rate, and has been known to collect six hundred dollars penalty for the felling of a half dozen trees on the prohibited list.

Thus does a timber agent relieve a State Government department of frictions between timber owner and buyer. The agent is immune to political interference and can get tough, if he wishes. It is his duty to follow the set forestry plan, to exact full compliance from the cutting crews, and to give the owner and the state a certified account of the quantity of wood taken out. For this service he is paid ten per cent of the purchase price, which brings him an income of about three thousand dollars a year.

Each timber buyer must post a performance bond at the time of his bid and must complete his payment before the logs are taken from the property so there are no bad debts in New Jersey's marketing plan.

Municipal taxes in New Jersey will average eighty cents an acre of woodland, annually. This impost is not burdensome upon lands managed for permanent wood production which returns a profit of about $2.50 an acre as an annual average. The "lump sum" sale of wood lots, once the accepted method of disposal, frequently did not represent fifty cents an acre for each year of the growing period, or about thirty cents an acre annually less than the tax bill. The woodlands sold for butchery continue to pay the full municipal tax even though they remain unproductive for a half-century.

New Jersey's plan recognizes and eventually will correct the common trend of farmers' woodlands toward self-extinction. The method of winning co-operation is no more radical than many other demonstrations, but it does apply scientific method to a branch of farm economy that all North America has grievously mishandled.

Rolling country usually provides good air drainage and favorable temperatures.

This is the first of a group of articles on orcharding by Mr. Ackerman.

Orchards

Where to Put an Orchard

Choosing the orchard site is important to fruit growing success

By WILLIAM ACKERMAN

ORCHARDING is a long time investment, whether practiced on a large or small scale, and consideration should be given to all the factors involved in selecting a desirable site. An error in planting annual crops can be corrected the following year, but to the orchardist, site selection must be a rather permanent thing. The principle factors in choosing a site are soil and topography. Without a favorable combination of them, orcharding can be hazardous. Constantly lower yields may result with even slight deviations from the optimum site. Actually there are more favorable sites than will ever be needed in this country for orcharding, yet a surprisingly large number of our orchards, both of the commercial and home types, are on poorly selected land. The importance of proper selection of orchard sites can not be over emphasized, because a mistake in this initial step often can never be remedied during the entire life of the orchard. In other words, conscientious management can not profitably offset the natural consequences of frequent late spring freezes, water logged soils, poor fruit color and loss of trees caused by poor orchard location.

Before selecting a region for fruit growing the home orchardist should make a study of winter and spring temperatures, moisture, soil and site conditions and the suitability of a certain kind of fruit for a given region or site. The commercial grower must carefully study all of these above mentioned factors plus such things as transportation and marketing facilities.

Check Weather Records

Temperature is the most important climatic factor affecting the geographic distribution of fruits and varieties of fruits. Man has little control over the temperature. Therefore, it is wise to check carefully

Trees should not be planted less than fifty feet from the bottom of a hill. Slight temperature differences are important, especially when the trees are blossoming.

Where to Put an Orchard

Continued

with local growers, horticultural extension specialists, and the local United States Weather Bureau regarding frequency of frosts and extremes in temperatures in past years. Extremely cold winter of 20-40 degrees below zero or violent fluctuations of rising and falling temperatures in the winter can prove fatal to any orcharding venture. For profitable fruit production it is necessary that the trees experience an uninterrupted winter rest period when life processes are held at a minimum.

Spring frosts or freezes shortly before, during, or after the blossoming period constitute one of the most hazardous conditions in fruit growing. They are far more destructive to the fruit industry than early autumn frosts. There are few orchardists who are fortunate enough to be completely immune to even occasional late frosts, but to suffer from frost injury year after year is one of the surest signs of a fatal enterprise.

Heavy winds which blow more or less continuously over an area are undersirable from several points of view. Strong winds during the period of blossoming often reduce the fruit set with subsequent reductions in the crop. If the winds are prevalent from one direction young trees tend to grow onesided. This more or less throws the tree off balance and may cause it to break under the weight of its first heavy crop.

Hail is a hazard to fruit growing which, although less serious than spring frosts, can be destructive to the fruit reducing it in grade, or if the stones are large enough completely destroying a season's crop.

The amount of sunshine directly affects the rate of food manufacture by the leaves which, in turn, affects the size and color of the fruit and the regularity with which the trees in regions of Washington State bear from year to year. For example, where sunshine is relatively abundant, fruit production per acre is greater and alternate bearing of light and heavy crops of fruit is much less pronounced than in Eastern states where there is more cloudiness during the growing season. The amount of sunshine may also be affected to a greater or lesser degree from proximity of orchards to heavy industrial centers, where factory smoke constantly clouds the sky.

Elevation Is A Prime Consideration

The elevation of the site in relation to land immediately around it is especially important in the prevention of frost and freezing hazards. Upland rolling or sloping fields which are not too steep for efficient orchard operations, broad ridges or upland plains bordering depressions are the most desirable sites. River bottoms or flat valley floors are definitely undesirable. During still

nights (especially important during blossoming time) the cold air drains from high lands into depressions and valleys, often resulting in damage to crops in these lower areas, while those on higher elevations may escape injury. Trees should not be planted lower than fifty feet above the base of the slope. A difference of 10 ft. in elevation may make a difference of five degrees to ten degrees in the minimum temperature encountered. In some seasons, such differences would mean the difference between a full crop and a crop failure. These colder temperatures at the lower elevations may at first seem contradictory to some people, since it is true that air temperatures become lower with increased elevations. However, during clear, still nights there is a temperature inversion. This phenomenon takes place because the layer of air which lies next to the earth is cooler, and, as cold air is heavier than warm, it flows downward; warm air rises. Air stratification may at times be so critical that blossoms on the lower part of a tree may be destroyed while those in the upper part remain uninjured.

Placing an orchard on the leeward side of a large body of water is a good substitute for elevation. Such a site usually experiences slow changes in temperature due to the tempering effect of deep water. A body of water that is large enough not to completely freeze over during the winter maintains a more even temperature throughout the year than a nearby equal area of land. Consequently, air masses passing over large areas of water will not have as great a variation in temperature as those passing over land. Land on the leeward side of a body of water will therefore experience the following advantages: 1. In spring, the air temperatures will remain at a lower level and retard plant growth beyond the date of frost injury . 2. In autumn, the period for ripening of fruit will be extended due to warmer temperatures near the shore line. 3. During the winter, there will be a reduction of violent and sudden changes from warm to extremely cold temperatures.

Soil Types

Fruit trees thrive over a wide range of soil types and the limits are not so exacting as with some other crops. However, experience indicates that soil alone may often cause a difference of 50 to 100 per cent in yield.

What constitutes a productive and what an unproductive soil? Often a very productive soil for farm crops may not be suitable for orchards and conversely, a less productive one in good physical condition may support an excellent orchard when properly managed.

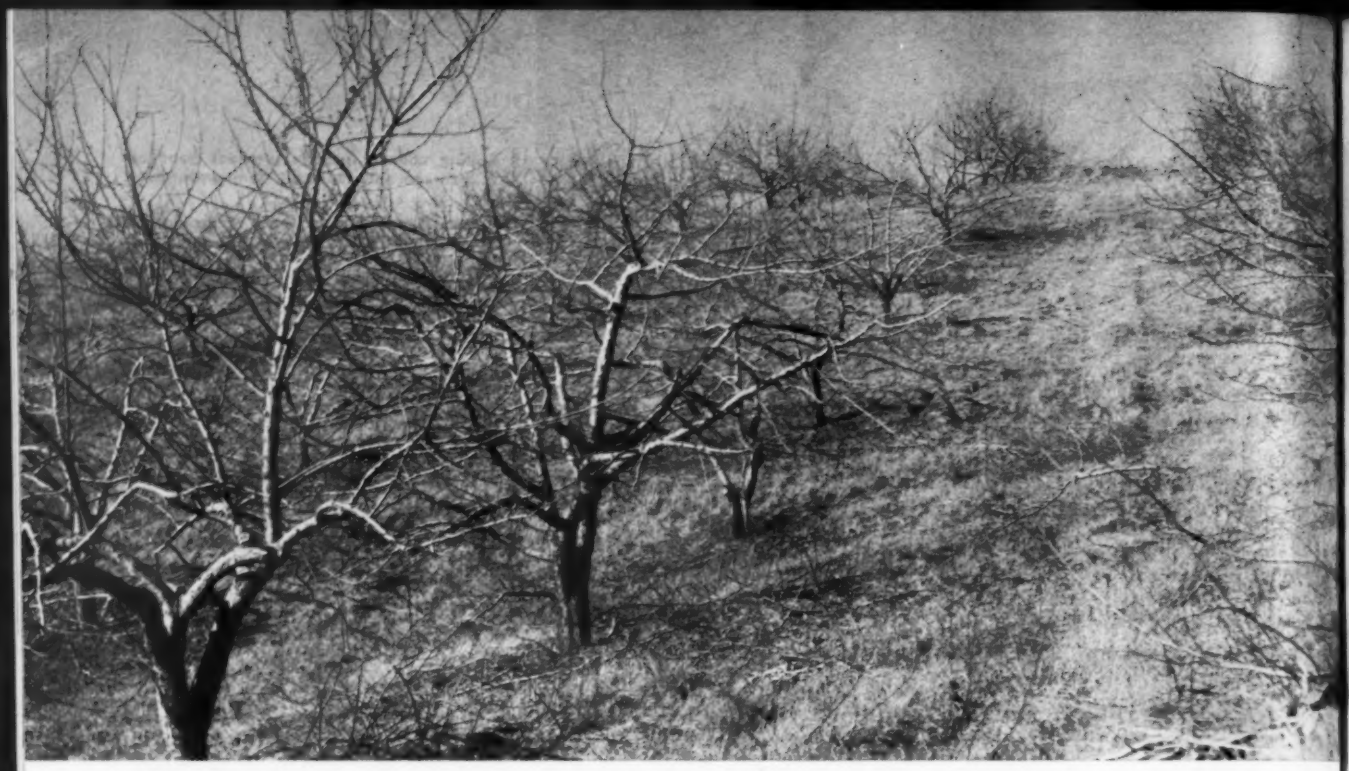
The first requirement of a good orchard soil is proper water drainage permitting good aeration and extensive root development. Orchard trees are deep rooted when compared to most other crops. Consequently the subsoil is more important than the upper layer of soil in selecting a proper site. When the subsoil is hard and impervious, trees often grow satisfactorily for a few years, but become weak when they mature. If a severe winter occurs, they may die. Fruit trees will not tolerate wet soils during the growing season. After a rain the water table rises, but should recede within a few days after the rain. If it does not, and ground water persists within a foot or so of the surface during the critical blossoming and fruit setting period, many roots will die and the tree suffers accordingly. Submergence of the root system for even a few days during the summer growing season, when temperatures are high, usually results in eventual death of the roots. A soil on which water stands for more than a week after a heavy rain is unfit for fruit growing. In most orchards, it is not unusual to find isolated wet spots where there are small depressions in the orchard. These can be avoided, or drained by tile, if this procedure does not prove too expensive.

Room For Root Development

The rooting area for a fruit tree should be at least four to five feet in depth, but this depends somewhat on the region and soil type. Heavy compact soils are unfavorable since soil aeration is an important factor for deep rooted, well established trees. Under optimum conditions for plant growth about half of the pore space, which in the average soil comprises about 50% of the soil volume, should be occupied by water and the rest by air. In compact soil the pores are very small and are filled with water so that the air is excluded.

The color of the soil gives an excellent index of its depth of drainage. Poor subsurface drainage results in inadequate aeration which causes mottling in the subsoil. These mottled colors are most usually brown and gray, yellow and gray, or yellow and brown. The depth of mottling corresponds to the depth of good subsurface drainage. If mottling occurs near the surface, such soils are usually too poorly drained for a good orchard site. A simple method of studying subsoil colors is through the use of a soil auger of the type that removes a continuous core of soil. A more difficult but better method is to dig a trench about 2 feet wide, several feet long and about six feet deep. This may seem like a lot of trouble, but when one remembers the years of work that may be wasted, every means should be used to insure success.

There are no fields in agriculture that do not involve risks. Whether the orchardist experiences much more risk than the average farmer is not for me to say, but the man who refuses to gamble with nature and the elements will make a poor orchardist. However, the thoughtful orchardist will reduce his chances of loss to a minimum. Remember, small obstacles overcome before the trees are planted can often prevent catastrophe later on.



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Where to Put an Orchard

Continued

with local growers, horticultural extension specialists, and the local United States Weather Bureau regarding frequency of frosts and extremes in temperatures in past years. Extremely cold winter of 20-40 degrees below zero or violent fluctuations of rising and falling temperatures in the winter can prove fatal to any orcharding venture. For profitable fruit production it is necessary that the trees experience an uninterrupted winter rest period when life processes are held at a minimum.

Spring frosts or freezes shortly before, during, or after the blossoming period constitute one of the most hazardous conditions in fruit growing. They are far more destructive to the fruit industry than early autumn frosts. There are few orchardists who are fortunate enough to be completely immune to even occasional late frosts, but to suffer from frost injury year after year is one of the surest signs of a fatal enterprise.

Heavy winds which blow more or less continuously over an area are undersirable from several points of view. Strong winds during the period of blossoming often reduce the fruit set with subsequent reductions in the crop. If the winds are prevalent from one direction young trees tend to grow onesided. This more or less throws the tree off balance and may cause it to break under the weight of its first heavy crop.

Hail is a hazard to fruit growing which, although less serious than spring frosts, can be destructive to the fruit reducing it in grade, or if the stones are large enough completely destroying a season's crop.

The amount of sunshine directly affects the rate of food manufacture by the leaves which, in turn, affects the size and color of the fruit and the regularity with which the trees in regions of Washington State bear from year to year. For example, where sunshine is relatively abundant, fruit production per acre is greater and alternate bearing of light and heavy crops of fruit is much less pronounced than in Eastern states where there is more cloudiness during the growing season. The amount of sunshine may also be affected to a greater or lesser degree from proximity of orchards to heavy industrial centers, where factory smoke constantly clouds the sky.

Elevation Is A Prime Consideration

The elevation of the site in relation to land immediately around it is especially important in the prevention of frost and freezing hazards. Upland rolling or sloping fields which are not too steep for efficient orchard operations, broad ridges or upland plains bordering depressions are the most desirable sites. River bottoms or flat valley floors are definitely undesirable. During still

nights (especially important during blossoming time) the cold air drains from high lands into depressions and valleys, often resulting in damage to crops in these lower areas, while those on higher elevations may escape injury. Trees should not be planted lower than fifty feet above the base of the slope. A difference of 10 ft. in elevation may make a difference of five degrees to ten degrees in the minimum temperature encountered. In some seasons, such differences would mean the difference between a full crop and a crop failure. These colder temperatures at the lower elevations may at first seem contradictory to some people, since it is true that air temperatures become lower with increased elevations. However, during clear, still nights there is a temperature inversion. This phenomenon takes place because the layer of air which lies next to the earth is cooler, and, as cold air is heavier than warm, it flows downward; warm air rises. Air stratification may at times be so critical that blossoms on the lower part of a tree may be destroyed while those in the upper part remain uninjured.

Placing an orchard on the leeward side of a large body of water is a good substitute for elevation. Such a site usually experiences slow changes in temperature due to the tempering effect of deep water. A body of water that is large enough not to completely freeze over during the winter maintains a more even temperature throughout the year than a nearby equal area of land. Consequently, air masses passing over large areas of water will not have as great a variation in temperature as those passing over land. Land on the leeward side of a body of water will therefore experience the following advantages: 1. In spring, the air temperatures will remain at a lower level and retard plant growth beyond the date of frost injury . 2. In autumn, the period for ripening of fruit will be extended due to warmer temperatures near the shore line. 3. During the winter, there will be a reduction of violent and sudden changes from warm to extremely cold temperatures.

Soil Types

Fruit trees thrive over a wide range of soil types and the limits are not so exacting as with some other crops. However, experience indicates that soil alone may often cause a difference of 50 to 100 per cent in yield.

What constitutes a productive and what an unproductive soil? Often a very productive soil for farm crops may not be suitable for orchards and conversely, a less productive one in good physical condition may support an excellent orchard when properly managed.

The first requirement of a good orchard soil is proper water drainage permitting good aeration and extensive root development. Orchard trees are deep rooted when compared to most other crops. Consequently the subsoil is more important than the upper layer of soil in selecting a proper site. When the subsoil is hard and impervious, trees often grow satisfactorily for a few years, but become weak when they mature. If a severe winter occurs, they may die. Fruit trees will not tolerate wet soils during the growing season. After a rain the water table rises, but should recede within a few days after the rain. If it does not, and ground water persists within a foot or so of the surface during the critical blossoming and fruit setting period, many roots will die and the tree suffers accordingly. Submergence of the root system for even a few days during the summer growing season, when temperatures are high, usually results in eventual death of the roots. A soil on which water stands for more than a week after a heavy rain is unfit for fruit growing. In most orchards, it is not unusual to find isolated wet spots where there are small depressions in the orchard. These can be avoided, or drained by tile, if this procedure does not prove too expensive.

Room For Root Development

The rooting area for a fruit tree should be at least four to five feet in depth, but this depends somewhat on the region and soil type. Heavy compact soils are unfavorable since soil aeration is an important factor for deep rooted, well established trees. Under optimum conditions for plant growth about half of the pore space, which in the average soil comprises about 50% of the soil volume, should be occupied by water and the rest by air. In compact soil the pores are very small and are filled with water so that the air is excluded.

The color of the soil gives an excellent index of its depth of drainage. Poor subsurface drainage results in inadequate aeration which causes mottling in the subsoil. These mottled colors are most usually brown and gray, yellow and gray, or yellow and brown. The depth of mottling corresponds to the depth of good subsurface drainage. If mottling occurs near the surface, such soils are usually too poorly drained for a good orchard site. A simple method of studying subsoil colors is through the use of a soil auger of the type that removes a continuous core of soil. A more difficult but better method is to dig a trench about 2 feet wide, several feet long and about six feet deep. This may seem like a lot of trouble, but when one remembers the years of work that may be wasted, every means should be used to insure success.

There are no fields in agriculture that do not involve risks. Whether the orchardist experiences much more risk than the average farmer is not for me to say, but the man who refuses to gamble with nature and the elements will make a poor orchardist. However, the thoughtful orchardist will reduce his chances of loss to a minimum. Remember, small obstacles overcome before the trees are planted can often prevent catastrophe later on.

An Organic Pioneer

The story of an early twentieth century organiculturist

By JACK VAN CLUTE

FROM the manner in which Organic Farming is spreading to all parts of the country one might think it's a new method in agriculture. Actually it's one of the oldest farming methods in history. The only new thing about it is the enthusiam of present-day organic farmers.

During the early chemicalized era the practice of one farmer who stuck to his belief in organic fertilizers is still fresh in my memory. He was an Ohioan who refused to be swayed by chemical claims. I first met him when I was a boy in a top buggy on my way to town. He was of medium build, tanned and rugged. And he was standing on top of a wagon load of manure, with one hand gripping a pitchfork stuck near his feet, the other holding the driving reins. He was John Warnock, hauling a load of manure from town to his forty-acre farm two miles away.

Recently, John had moved from an Ohio farm to our Illinois neighborhood. He'd had basic experience on the old farm back east, and now he'd settled on one of the poorest farms in our section. Every acre looked discouraging. Patches of sickly weeds struggled on thin clay soil cropped to the limit. When John arrived the farm was eroding, with each rain sweeping tons of it into the creek cutting the northerly part and turning the stream a muddy brown. No one wanted to rent the place, much less buy it. John arrived unannounced and without asking questions, bought the farm. That was a move which caused head shaking in the neighborhood.

Later, heads shook more when John made another odd move. In Alexis, a town of less than a thousand, were two livery stables which ultimately went the way of such places by evolving into garages. But shortly after the turn of the century, a pile of manure accumulated at the rear of each stable. By late summer the manure became a big mound attracting swarms of flies, though complaint was minimum because small-town public health was in swaddling clothes in the early 1900's. The manure was considered more of a nuisance than a menace. John went to the livery stable men and offered to haul away all manure —and keep it from piling up—if they would give it to him. To make sure, the stable men asked him to repeat his proposition. He did, but he still sounded like a newcomer anxious to be short-changed. Quickly the men replied, "Fine, Mr. Warnock, only remember you've got to keep it hauled away or we won't give it to you."

That was the start of a farming routine which kept John Warnock busy every odd hour the year around. In slicker coat during summer rains, and in overcoat in winter, he kept his promise by hauling away manure as fast as it accumulated. With pitchfork he spread wagon load after wagon load of manure on stubble field, stalk field, meadow and pasture. Come rain or snow, John kept his promise. No more manure piles around livery barns.

That was before the day of emphasis on mulches. But when growing crops were in the way John mulched open fields and then in Spring used a two-horse walking plow to turn the residue under. He seemed to be doing things the hard way, nevertheless he kept busy and healthy.

His first corn crop was a little better than average for that farm, though not good enough to brag about. The stalks were rather spindling and too many ears ran to nubbins as usual. Neighbors still were shaking their heads. They didn't want that farm or any of the hard work which went with it.

But the second corn crop looked as though magic had been at work in that clay soil. In the first place the soil had changed its complexion, turning from sickly yellow to a healthy dark color. Furthermore, the corn grew dark green and was unaffected with smut, borers—yes, even grasshoppers save for a little showing along roadside rows. And the tassels were higher than John's head. Passers-by began slowing down for a better look at the field. Such corn growing on an old, run-down

farm like that was unbelievable. Yet —seeing was believing, and there was a road on two sides of the field for a good look.

The third year when neighbors' corn ran from 35 to 45 bushels an acre, Warnock's topped the 50-bushel mark. And long after corn picking, the stalks stood straight and sturdy to cause comment. But among most old-timers the big question was, "How in thunder is John ever goin' to get those stalks harrowed down and raked up to burn?" In Spring John answered that with a stalk cutter, and then plowed under all choppings while neighbor fields billowed with smoke from stalk windrows—largely a dark-brown smoke which later an agricultural professor explained was phosphorus pentoxide worth 25 cents a pound at the current rate.

From the third year on, Warnock's increasing yields left no room for argument. Folks had to admit that he had a real farm, though they were hesitant about following his organic method. Seasonably, Warnock rotated crops—corn, oat and timothy-clover hay. His hay outyielded others by fifty per cent. Occasionally small patches of oats grew so rank they lodged but the organic policy went on. When fall plowing time came, his second growth clover would be streaked with crimson, and all went under.

But the big pay-off for hauling livery stable manure two miles winter and summer was in the form of improvements in every nook and corner of the farm. John built a modern home, painted white with green trim. He put down a deep well with windmill pump to supply running water while neighbors still used the old hand pump or rope and bucket; they also were living in homes built of green-sawed lumber when that part of the country was new. John's cows browsed in bluegrass pasture watered by a creek which now ran clear. Two years on that place and he had no more erosion problems. The old farm had gone down stream, but the organic one stayed put. He saved a grove of box elder and elm for his herd to loll in summer shade. As his dairy herd increased, so did his drove of hogs to follow the cows. Likewise his flocks of chickens, ducks and bronze turkeys. With chicken netting around the garden patch, the fowls had field range for grasshoppers and other insects. Instead of high-priced store feeds John fed home-grown grain in winter. In the days of 10 and 15 cent eggs he told me that his chickens alone more than paid the grocery bill.

In John's time, straw was considered an excess on many a farm, being used a little for bedding and the rest left to rot in field stacks. In winter livestock had the run of stacks. The animals wasted a great deal and by spring would have the piles eaten down to grotesque shapes, ready for the match. In the Dakotas threshing outfits had straw burners to heat engine boilers, and in Fall the stubbles were burned off to clear the ground of trash. But Warnock never wasted a forkful of straw, nor did he burn off his fields. What straw he didn't use for litter, was returned to the soil along with manure.

I never heard him speculate on the nitrogen, potassium, phosphorus and calcium content in a load of manure, probably because he wasn't thinking in terms of plant food elements. But his credo was in the same pitch as that which an Ag teacher once stressed to a group of us young farmers: "Manure's The Fertilizer For Me." Those were prepenicillin days, to say nothing about mycorrhizal relationship waiting around the corner for scientists to discover. But John liked to see toadstools growing on his farm during the first warm rains in Fall, so he stuck to manure and plowed under toadstools.

The rest of the story is just as natural. Eventually Warnock sold what had been a run-down farm for a top price. How much, I never knew, but good farms were selling for around $300 per acre shortly after World War 1, about the time he sold. Whether he realized it or not he was an all-out organic farmer.

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In the interest of spreading practical knowledge about the Organic Method, The Organic Farmer is offering one prize of $50, two of $25 and three of $10 for the best stories of actual experiences with organiculture. Literary style is not too important—it's your thoughts that count. Let us know what ideas you have that you think are worth passing on to other farmers. Send along photographs if you can get them. See last month's Organic Farmer for more information.

Start writing now — contest closes May 15

THE LARGEST AMERICAN FLOCKS OF THE EXOTIC KARAKUL GRAZE THE SPARSE RANGE OF NEW MEXICO.

Books

Black Sheep of Bokhara

Twin Karakul sheep were born on the Organic Experimental Farm this morning, bringing the number in the flock to nine. My interest in these black sheep aroused by this relatively unusual birth (twins come once in twenty), I decided to see what I could find about Karakuls in the new Macmillan book, *Modern Breeds of Livestock*, by Dr. Hilton M. Briggs.

It is explained in this rather comprehensive book that Bokhara, the point of origin of the Karakul sheep, is about the most unfavorable place to attempt to raise livestock. Lying at an elevation of 8,000 feet, Bokhara's summers are hot and its winters cold. Grass is available only from the first of March to the end of May.

However, it seems that Karakuls thrive on adversity. L. Hagerman has noticed this characteristic in his flock of several thousand Karakuls in New Mexico. During "wet" years, when as much as 12 inches of rain fall, the black sheep do worse than they do during dry, five inch years.

Dr. Briggs points out Nature's unusual way of preserving the Karakul's preference for poor range. The Karakul has an extremely fat tail, and the better the range conditions, the fatter their tails become. If the ewes find the foraging good, their tails will become so large that they interfere with reproduction. Consequently, the heavy eating strains are weeded out.

Contrary to popular opinion, the "Persian" lamb or Karakul is not a profitable sheep. Pelts sell on the open market at approximately $4.50. Obviously, the breed is profitable only where the breeders overhead is low. The wool of mature sheep, being coarse, is worth little.

Competition from Southwest Africa, Bokhara and Afghanistan is the main stimulus to low Karakul pelt prices in this country. "It is estimated," says Dr. Briggs, "that we annually use approximately four million lamb skins, but that we produce only about 8,000 of them."

About the only way for a Karakul breeder to make money is to sell breeding stock to other breeders. Breeding stock sells for exorbitant prices, probably because of misconceptions about lamb pelt values. Nevertheless, "The biggest drawback the breed has is its low income producing value," states the author.

—R. R.

Utilizing Poultry Manure

By THOMAS E. JOHNSTON

THE NEXT time someone cautions you against the supposed evils of poultry manure, probably claiming that it "burns" plants, defend this product of the poultry industry by showing how it can be successfully handled by using organic methods.

"Poultry manure burns plants." "Poultry manure must be used with caution." "Poultry manure gives off foul odors." These libels have been repeated so often in speech and in print that even poultrymen have repeated and believed them. As a result of believing such misstatements, they have wasted and misused their valuable product.

In some poultry-producing sections used litter and manure from chicken houses are given away for the hauling; in some places quantities of manure are dumped into holes in the ground, such as unworked quarries, as if it were so much trash to be gotten rid of.

I do not believe we should lower our appraisal of poultry manure even to the extent of calling it a by-product. We who have gained the organic concept of soil fertility realize that growth is but one half of the "wheel of life" pictured by Sir Albert Howard; decay is the other and equally essential half, and in this half manure and so-called waste products are essential helpers.

The Poultryman as a World Figure

A poultryman, however small his flock, becomes thru commerce a world figure. When he buys mash or grain from his feed dealer, he is drawing upon fertility of soils far away. Perhaps these fields lie in the wheat or corn belts of the United States, perhaps in some other country of the world. After he feeds the grain to his flock, some part of it becomes human food in form of eggs and poultry meat. Another part becomes poultry manure, which as continued production requires, should be returned to the soil.

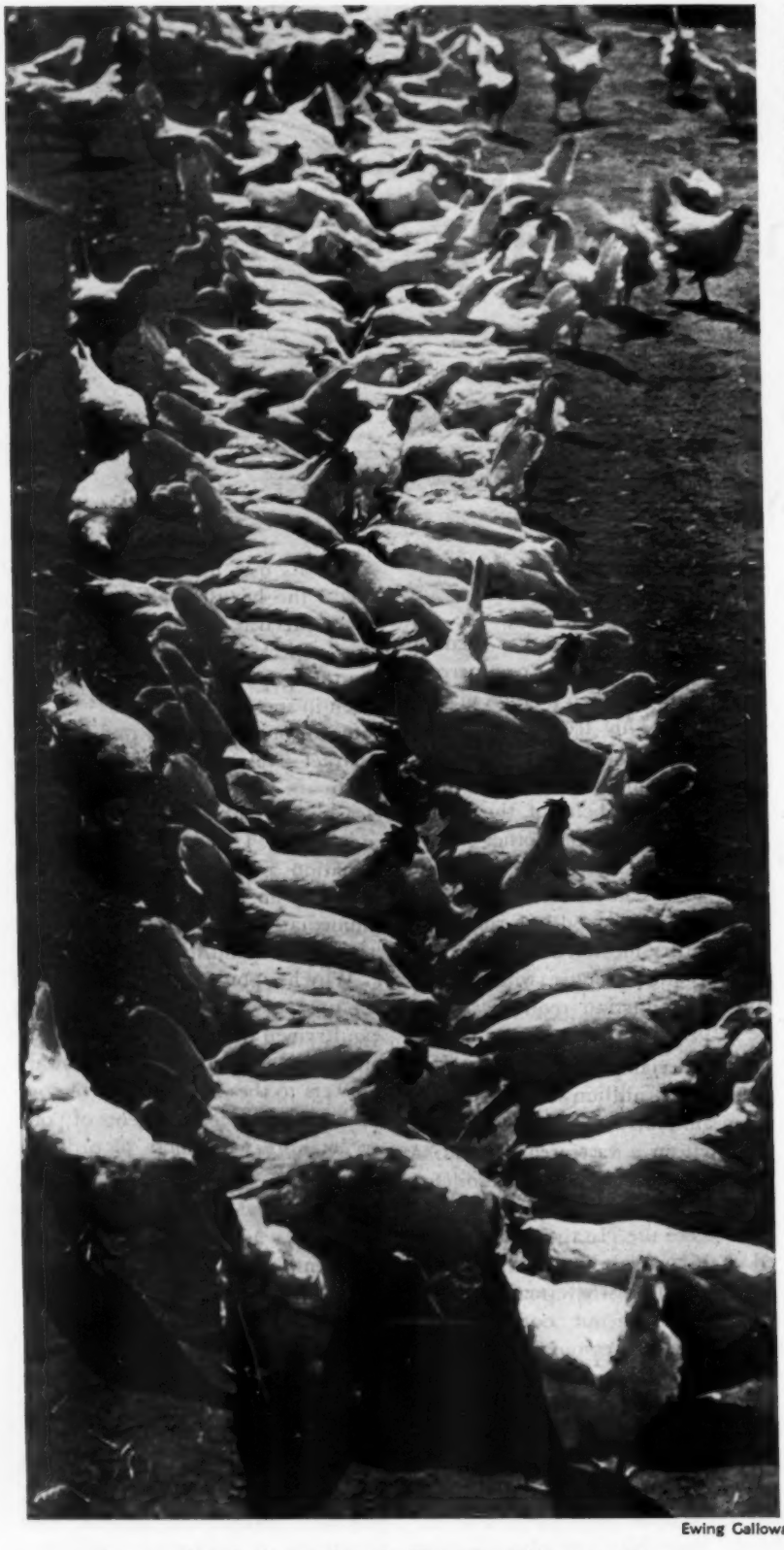
Into specialized poultry-producing areas pour millions of bushels of grain annually, representing fertility drawn from a vast area of land. A great deal of this potential soil fertility is lost or wasted thru poor methods of use. In the eastern United States we often find specialized poultry regions where manure is literally dumped out not far from truck-growing regions where soils need them badly, but the latter imports fantastic quantities of commercial fertilizer.

It is definitely to the interest of the poultry industry, as well as to the interest of crop farmers of all kinds, that they use these wasted resources. Their business depends upon its use; upon its use also depend the health, welfare, and ultimate survival of people. Perhaps we can expect advances in methods of handling poultry manure. Poultrymen in specialized areas may cooperate to prepare their product and market it as compost. Poultrymen, who are also general farmers, are learning to use manure more economically. Those who operate combination poultry and truck farms stand in an ideal position to profit immediately by applying organic method in handling their manure.

Why has poultry manure acquired an unsavory reputation? What can poultrymen do to realize its full possibility? As a starting point toward answers to these questions, let's compare plant nutrient contents of poultry manure with those of ordinary or "average" stable manure.

Plant Nutrients	Poultry Manure	Stable Manure
Nitrogen	2.12%	0.5%
Phosphoric acid	1.21%	0.3%
Potash	0.6%	0.5%

The higher nitrogen content of poultry manure is a part of the story. This explains why fresh, undigested poultry manure, if applied to plants, produces unbalanced growth and sometimes a withering condition described as "burning". This higher



Ewing Galloway

Don't neglect the income from fertilizer your chickens can give you.

nitrogen content also gives rise to ammonia gas and its unpleasant odor from a pile of manure lying exposed to rain and sun. The odor of ammonia sometimes is stifling inside poultry houses, causing discomfort to people and promoting disease among chickens.

Whenever you get a smell of ammonia gas around a manure pile or stable, you may assure yourself that nitrogen is escaping beyond the reach of plants. Such an odor stands as an undeniable symptom of wasted plant nutrition.

Still another bad result from mishandling this high nitrogen content may be seen where fresh poultry manure is spread on growing grain. Wherever the manure spreader drops a bit of its cargo, grain stalks collapse before harvest. Lush but unbalanced growth resulting from the too-rich and undigested nitrogen content of the manure, has produced stalks too weak to support their own weight.

Management in the Poultry House

Certain practices in the poultry house keep down nitrogen losses and prevent ammonia fumes. Sprinkling ground phosphate rock and ground dolomitic limestone into the litter will help. These materials aid in keeping litter dry as well as combining with nitrogen to form a relatively involatile compound. Composting of poultry manure can actually be started on the poultry house floor.

In selecting litter for the poultry house, first consideration should go to its water-holding capacity. Cutting straw by running it thru a roughage mill doubles its capacity to hold moisture. Dry ground corn cobs absorb a large amount of moisture, and may be used in combination with chopped straw. Finely shredded corn stalks also have large absorptive capacity. These home-grown products are available to many poultrymen. Commercially produced peat moss and dried shredded stalks of sugar cane may be bought from supply houses.

Methods of Handling Poultry Manure

Since the making of compost in heaps requires more labor than most of us care to spend, and valuable nutrients are often washed out of the heap, it is most practical to spread the manure right in the field. However, certain precautions must be taken. If manure is exposed to the sun and air for several days before being disked or plowed in, it will lose most of its value.

We also find that good results with poultry manure are obtained by applying a light sprinkling of the manure on fields carrying a heavy plant cover, such as a field of sod. The heavy sod supplies enough carbon to produce a balanced decay with the nitrogen and other nutrients carried in the manure.

Since sod is not always available, crops may be planted and grown for the specific purpose of supplying plant material to balance the high nitrogen content of poultry manure and to aid in field composting. Small grains, thickly sown corn, sorghums, Sudan grass, soy beans and other quick growing annuals are well adapted to sheet composting. Sprinkled lightly with poultry manure, then worked into the soil, these crops improve soil structure and result in increased fertility and improved yields.

If, for some reason, it is not possible to grow a special crop to receive the manure, fresh plant matter can be mixed with the poultry droppings and spread on the fields to be fertilized as a mulch. Or, this mixture of manure and green matter can be disked into the soil. The general farmer has plenty of plant residues in the farm straw, low-quality hay, or corn stalks, but the specialized poultryman may be hard pressed to find enough. As suggested earlier in this article, the solution of this problem requires cooperation between poultrymen in specialized areas in preparing their product into compost. Specialist poultrymen may also be able to work out cooperatives

(*Continued on page* 48)

Hairy Vetch,

An Excellent Soil Builder

By KENNETH O. DAVIS

HAIRY vetch has proven to be one of the best soil-building plants available, and a lucrative cash crop at the same time. Experiments by farmers in Central Oklahoma have shown the many benefits derived from vetch.

About 10 years ago a SCS unit conservationist recommended vetch to a group of these Central Oklahoma farmers, as the best soil-building legume available. Since that time, this group has found that the conservationist was more right than he realized. They found that vetch used in small grain rotations increased yields enormously. Vetch and wheat grown for several years in a row not only increased grain yields three to 10 bushels per acre, but the vetch also yielded 150 to 400 pounds of seed per acre. The average price received at harvest for vetch seed has been 15 cents per pound.

Vetch also proved itself to these farmers because:

1. It is one of the best winter and early spring temporary pastures.
2. It increases the fertility of the land by adding organic matter.
3. It is a good cash crop.
4. It furnishes good cover for the land during critical periods.
5. It increases yields of small grain crops grown with it and of other crops following in a rotation.

About two tons of vetch residue per acre are returned to the soil when the vetch crop is allowed to mature and is harvested for seed.

About 60 pounds of nitrogen per acre are produced by nodule formation on the roots, worth about $6. Also, some $2 worth of phosphate per acre is left in the residue.

The residue contains that added nitrogen and phosphate in an organic form which is the best source of plant food for crops following. A vetch and small grain mixture usually requires about 15 to 20 pounds of vetch and 50 pounds of wheat or 30 pounds of rye per acre. The Oklahoma experiments also disclosed that the residue of mature vetch left on the land returns practically as much organic matter and plant food as if it were plowed under green.

Balanced Fertility with Green Manure

(*Continued from page* 14)

Only nature through centuries of time can completely correct this damaging loss to productivity.

A vigorous cover crop seeded with the contour will do considerable to prevent or reduce the erosion hazard, and will at the same time save much fertility from loss by leaching. The binding effect of the root and the surface protection of the top growth both are helpful in conserving the most valuable top soil. It is never safe to leave a sloping soil bare during a season of heavy winter and spring rains.

Early Seeding Desirable

The high value of the cover crop for mobilizing and conserving soil nutrients justifies considerable care in the selection, seeding and fertilizing to get good growth. Early seeding to make enough fall growth and liberal fertilizing to get good vigor are desirable.

In certain types of farming there is no substitute for cover cropping and green manuring for soil conservation and improvement.

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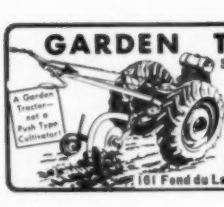

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Memos To Farmers

Another View of the End of the World

IT SEEMS that since the beginning of his stay on earth, man has been decrying and predicting the end of the World, or at least the end of civilization. When one keeps that fact in mind, it is always a little difficult to take any stock in the words of present day disaster-howlers. We get to feel that the thought of the end of society is the result of society itself.

However, E. B. White, one of our great contemporary writers, has done an extremely convincing job of bringing into focus, satirically of course, the end of the planet Earth. His futuristic short story, "The Morning of the Day They Did it," is a part of the February 25 issue of *The New Yorker* magazine.

Mr. White has always been a friend of natural agriculture, and he assigns a definite place in Earth's downfall to the artificial state of farming toward which we are so rapidly falling. He describes, in his inimitable and believable style, a world devoid of birds, bees and worm-eaten fruit—where the only honey available is a mixture of mineral oil and papaya juice. Tri-D solution, the miracle pesticide, is the villian in this abortion of nature. It was "the pesticide that had revolutionized agriculture, eliminated the bee from nature, and given us fruits and vegetables of undreamed of perfection but very high toxicity."

Every person in this nightmare world was forced to take an anti Tri-D injection every 21 days to overcome the effects of the poison. Since no bees existed, all pollination had to be done by hand.

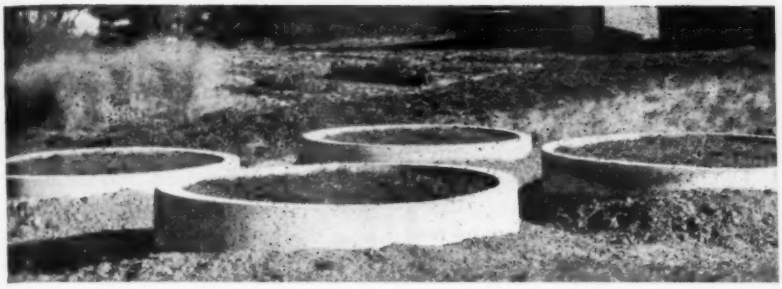
The bull-baiting concept of artificial insemination and the pushing of dairy cows is also lashed. "Well," says one of Mr. White's spokesmen, "we all know what has happened to the dairy industry, with many of our best milch cows giving milk continuously right around the clock, in a steady stream. True, the cows do have to be propped up and held in position by special stanchions and fed intravenously, but I always say it isn't the hubbub that counts, it's the butterfat." Would it be possible to find a better expression of the trend of the dairy industry today?

At the climax of the story, our narrator is somehow projected to another planet by the Earth-destroying explosion of the successor to the hydrogen bomb. Transplanted to a society unhindered by the ingenuity and capacity for endeavor of the defunct earthlings, he is at peace. "I like the apples here better than those on earth," he exclaims. "They are often wormy but with a most wonderful flavor. There is a saying here: 'Even a very lazy man can eat around a worm.'"

Activities of the Soil and Health Foundation

The Soil and Health Foundation has undertaken to build a battery of cement cylinders in which to conduct controlled planting experiments. Four of the cylinders, the first to be built, are illustrated.

A comparison of wheat and barley grown by the organic and the chemical methods is now being conducted. Soil from a farm that uses chemical fertilizers continually was imported from nearby the Organic Experimental Farm and placed in two of



the cylinders. The other two contain soil treated with the amount of organic fertilizer and ground rock that it would normally receive in the field. The cylinders were then planted in the usual manner.

When the crops of wheat and barley are ripe, an accurate comparison can be made. A planned fertilization program will be carried out for many years and the long term effects of both techniques will be observed. The grain will be tested for vitamin and mineral content in the Foundation laboratory on the experimental farm.

Chemical Fertilizer Injury Increases in California

The California Experiment station reports that damage to greenhouse gardenias from soluble salts is becoming quite a problem in that state. The salts are built up in the soil by the use of chemical fertilizers and by excessive irrigation with water from deep wells.

It is easy to understand how chemical fertilizers can cause this type of crop damage. In the case of superphosphate, the plant food in rock phosphate is made extremely soluble by the addition of sulfuric acid. When the fertilizer is used, the phosphorus is taken up by the plant, washed out or absorbed into the soil in an unavailable form. However, the toxic elements that were used to make the phosphate rock soluble build up in the soil and cause damage.

The use of organic fertilizer will eliminate soluble salt damage—even when it is caused by using irrigation water of high saline content. Organic matter acts as a buffer in the soil, preventing damage to plants from poisonous substances that may slip into their environment.

R. R.

Electric Measurement Of Soil Moisture

L. H. Houck

An electric device for measuring and recording the moisture in the soil has been invented and patented by Robert J. Hagerty, San Gabriel, Calif. The patent number is 2468-972 and an explanatory leaflet can be had from the patent office.

The device consists essentially of two buried electric conductors and a means for measuring the flow of current between them. The amount of flow will vary according to the amount of moisture in the soil since its conductivity changes with the percentage of wetness.

The device is intended for permanent installation and will have particular interest for owners of irrigated lands and orchards since by being able to read the amount of moisture needed on a dial, they may take just the amount of expensive water needed and always at the correct time.

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BIG BIRDS! Terrific Layers! U.S.—R.O.P. records to 349 eggs and flock averages over 250. Pullorum Clean & U.S. Certified. Chicks grow fast and don't need to be pampered! They can take it! Write for Catalog.

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Poultry

Salt Poisoning of Poultry

The fact that livestock usually can tell when they've had enough salt may lead some poultrymen to feed salt to their flock cafeteria style. This is a grave mistake, as the following item from a Department of Agriculture bulletin will point out.

"Chickens, turkeys, pigeons, and other species of fowl are susceptible to poisoning by common salt when large quantities are consumed at one time. Ordinarily, from one-third to one-half ounce of salt would be a fatal dose for the average chicken. Care should be taken not to leave fish brine, freezing brine, or ice-cream salt within reach of the fowls, as they may swallow sufficient quantities of the material to poison them.

"*Symptoms.*—This form of poisoning is manifested by progressive paralysis symptoms accompanied by extreme drowsiness and finally death by asphyxiation due to the weakening effect of the poison upon the muscles of respiration.

"*Post Mortem Appearance.*—The mucosa of the mouth is covered with a dirty viscid exudate. Evidences of congestion and ulceration appear on the mucous membranes of the esophagus, crop, and intestinal tract. The internal organs and nerve centers are more or less congested, and the blood possesses a peculiar bright red coloration.

"*Treatment.*—There is no medicinal treatment for salt poisoning of poultry."

Oyster Shell, Grit Help Hen Lay Eggs

Hens need both oyster shell and grit to do a good job of egg laying; these two materials do not accomplish the same thing.

Oyster shell supplies the hen with additional calcium or lime which she needs to make egg shells. It also provides calcium for bone formation. A hen that lays 200 eggs a year will put into the eggs about 14 times as much calcium as is found in her body.

Grit is a hard substance that does not dissolve but stays in the gizzard where it aids in grinding grains and tough feeds, making up for the hen's lack of teeth.

Soil and Health Foundation Leucosis Experiment

The Soil and Health Foundation has just started a feeding experiment with 50 day old chicks furnished by one of the largest breeders of chickens in the United States. These chicks come from a strain that are extremely susceptible to the disease, leucosis, which is ravaging many commercial poultry flocks today. It is safe to say that about 20% of chickens in many flocks today are afflicted with leucosis which enlarges their liver and causes them to stop laying.

The idea of the experiment, which is being conducted by the Soil and Health Foundation, is to feed them food raised organically to see if it can curb the strain of leucosis in these chicks. The answer will be available by the end of the summer.

The Soil and Health Foundation is dependent upon moneys received from the public and we trust that those of you who are not members of the Soil and Health Foundation will consider this.

To become a member it is necessary to make a contribution. No amount is either too large or too small. I hope also that existing members will now send in their contributions for 1950. Please send the money to J. I. Rodale, Soil and Health Foundation, Emmaus, Pennsylvania.

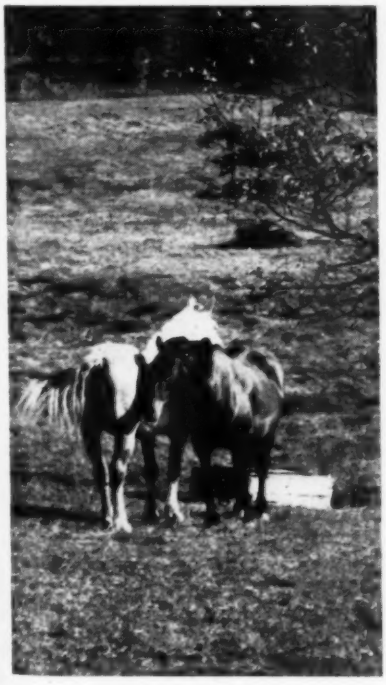
Horse Sense

Two horses standing in a pasture where flies are bad, will stand side by side, but will reverse their positions, so that the head of one horse is near the tail of the other. While they stand there peacefully together, they keep their tails swishing in the air and thereby keep the flies from bothering each other's head and eyes.

I have noticed this interesting fact of horses for many years, whether they are out on pasture or resting under some shade tree.

It is common practice in our farmyard, and while driving over the country and passing many grazing pastures, I find that other horses practice the same technique. It may be one of the many little traits that has caused the origin of the phrase "horse sense."

A. B.



Dry Dairy Cows Deserve Good Care

Dry dairy cows, next to growing heifers, are probably the most neglected animals on the average farm, believes Dr. R. D. Hatch, University of Illinois College of Veterinary Medicine.

Dairy cows deserve good care all the time, not just when they are in production. The kind of care cows get during the dry period helps to determine the amount of money they will earn for you after they freshen.

Dr. Hatch believes it's usually best to dry up a cow gradually. Ending a milking period puts a strain on the udder. If mastitis germs are present, the strain may cause them to set up a severe infection.

Dry cows should also be fed properly. Cows in good condition at calving time usually give more milk than cows in poor condition. Good rations also help to build resistance to disease.

STARTED Pullets · Broilers
CASH SALES much sooner
INVESTIGATE!
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SINCE 1895 BERRY'S AUSTRA-WHITES
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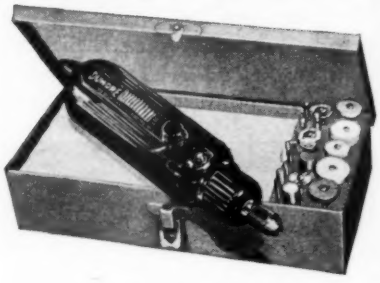
Kurt Wandel Industries

The Agro-Mulcher, newest development in the field of organic farming, eliminates weeding and cultivating and conditions the soil. Manufactured by Kurt Wandel Industries, this implement utilizes farm wastes in preparing a fluid mulch which, when applied to a field, prevents the sun from baking a hard crust on the soil. This does away with the need for cultivating. It also eliminates weeding, for weeds cannot grow through it. Since cultivating and weeding aren't necessary, plants can be set much closer together, greatly increasing the yield per acre. The fluid mulch retains rain and moisture and delivers it gradually to the soil. Leaves, weeds, old newspapers, manure, straw, hay, corn husks and other matter may be used in preparing the mulch. This machine is available in three sizes: the gardening, professional, and land models.



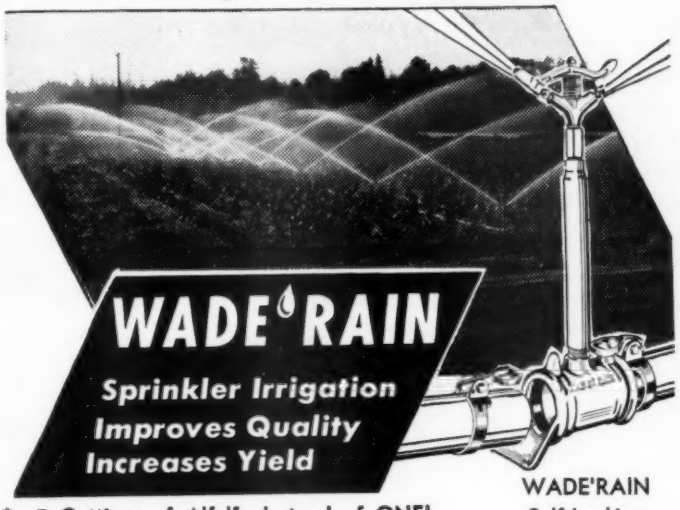
Hobby Tool
The Dumore Co.

The Hobby Tool, light-weight, powerful handgrinder, has recently been announced by The Dumore Co. A low cost tool, it can be used as a handgrinder for plastic carving, model building, shop use or work around the house and farm. With it the hobbyist can sand, grind, saw, drill, engrave, buff, polish, burnish, sharpen, carve, burr, and shape. It features push-button lock for instant no-wrench tool change, handy thumb switch for split-second control and engineered shape and balance for increased ease of handling.

Allis-Chalmers
Rear Mounted Engine Tractor

Announcement of a new low price farm tractor featuring a rear-mounted engine design has been made by the Allis-Chalmers Manufacturing Co. Designated the Model G, it is designed to offer the operator a clearer view of the ground area in which his tools are operating. The Model G's operating economy and low price make it attractive to part-time farmers and to regular farmers who need an auxiliary tractor for performing chore jobs and for helping out with the field work during the busy season. The Model G also answers the needs of commercial vegetable growers, floriculturists and nurserymen, whose operations call for accurate planting and close cultivation of narrowly-spaced row crops.

Turn Water Into Gold
With *Sprinkler* Irrigation *



* 5 Cuttings of Alfalfa Instead of ONE!

*400 Bu. Potatoes per Acre Instead of 125 Bu.

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B.C.A. contains the trace elements, lacking in many soils and so necessary for the best results.

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ORGANIC PRODUCTS
Dept. B 235 Halsey St.
Newark, N. J.

Utilizing Poultry Manure

(*Continued from page 41*)

with crop and truck farmers for their mutual benefit.

In having an unbalanced material with which to work, the specialized poultryman stands in a position somewhat similar to that of the specialized grain farmer who produced the grains which went into the chicken feed. The grain farmer, of course, has an excessive amount of straw, the decay of which is difficult because he lacks enough material of nitrogenous content to balance with it. They stand at opposite ends of an economic line, and are often separated by many miles, possibly thousands of miles; but sometimes they may be within a reasonable distance of each other.

In manure, as in eggs, poultrymen have a valuable product, which to reach its full potential of worth, exacts certain requirements in handling and in use. It is a part of the poultryman's business to learn how to get greatest returns from his poultry manure, just as he does with the eggs and poultry meat which his flock produces. Suppose someone should tell you that one should be careful about eggs—that eggs might develop a "burning" in the stomach? It would no doubt occur to anyone who heard this statement to inquire what quality of eggs the person had been eating, how many dozen he consumed at one time, and whether he ate other foods besides eggs. Or someone might tell you that eggs develop a foul odor. Again, no doubt, you would inquire how long these eggs might have been exposed to high temperatures. Eggs do "go bad" if exposed to a temperature of 70 to 80 degrees fahrenheit for only a few days.

Probably if someone told you about these supposed bad qualities of eggs, you might counter with: "Eggs are a valuable and delicious food provided you store and use them with discretion." Could not the same recommendation be applied just as aptly to care and use of poultry manure?

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ENGLISH MANURE WORMS: fast breeders. Convert green manure, garbage, etc. directly to Humus. No composting necessary. Free pamphlet tells story. 1000—$5.00, 500-$3.00. **PHILLIPS WORM FARM, Box 22, Bessemer, Alabama.**

EARTHWORMS for Farm Production use. 15 Years Experience. Informative Circulars. Backed by Service, Most Reasonable Prices. No Failures Following Our Methods. **R. A. CALDWELL, Barwick, Georgia.**

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There's a big demand for food grown by the organic method. If you grow more than you use, sell your excess supply by advertising in the classified columns of THE ORGANIC FARMER. You'll be surprised with the results.

DOMESTICATED worms put in NOW will, by spring, improve your soil wherever it's most needed. **Mrs. WM. J. GROTH, Chesterfield Worm Farm, Route 7, Richmond, Va.**

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MAN, 50, family, desires part in developing organic project. Enjoy experimenting. Possible investment. **S. S. SCHUTTE, 7400 Leighton Ave., Lincoln, Nebraska.**

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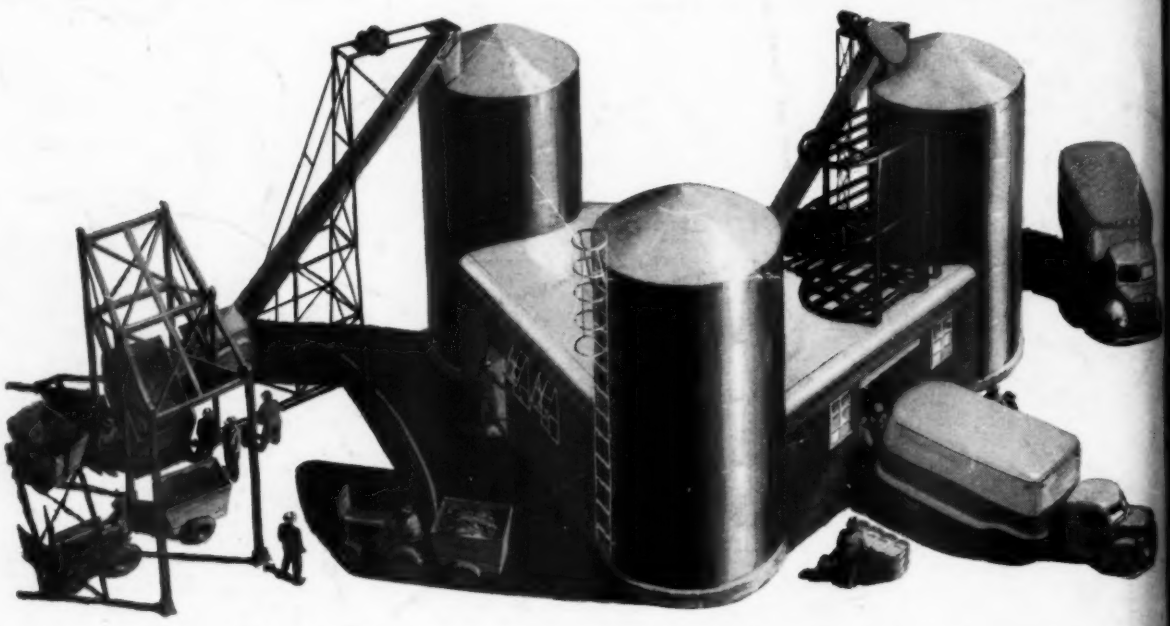

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